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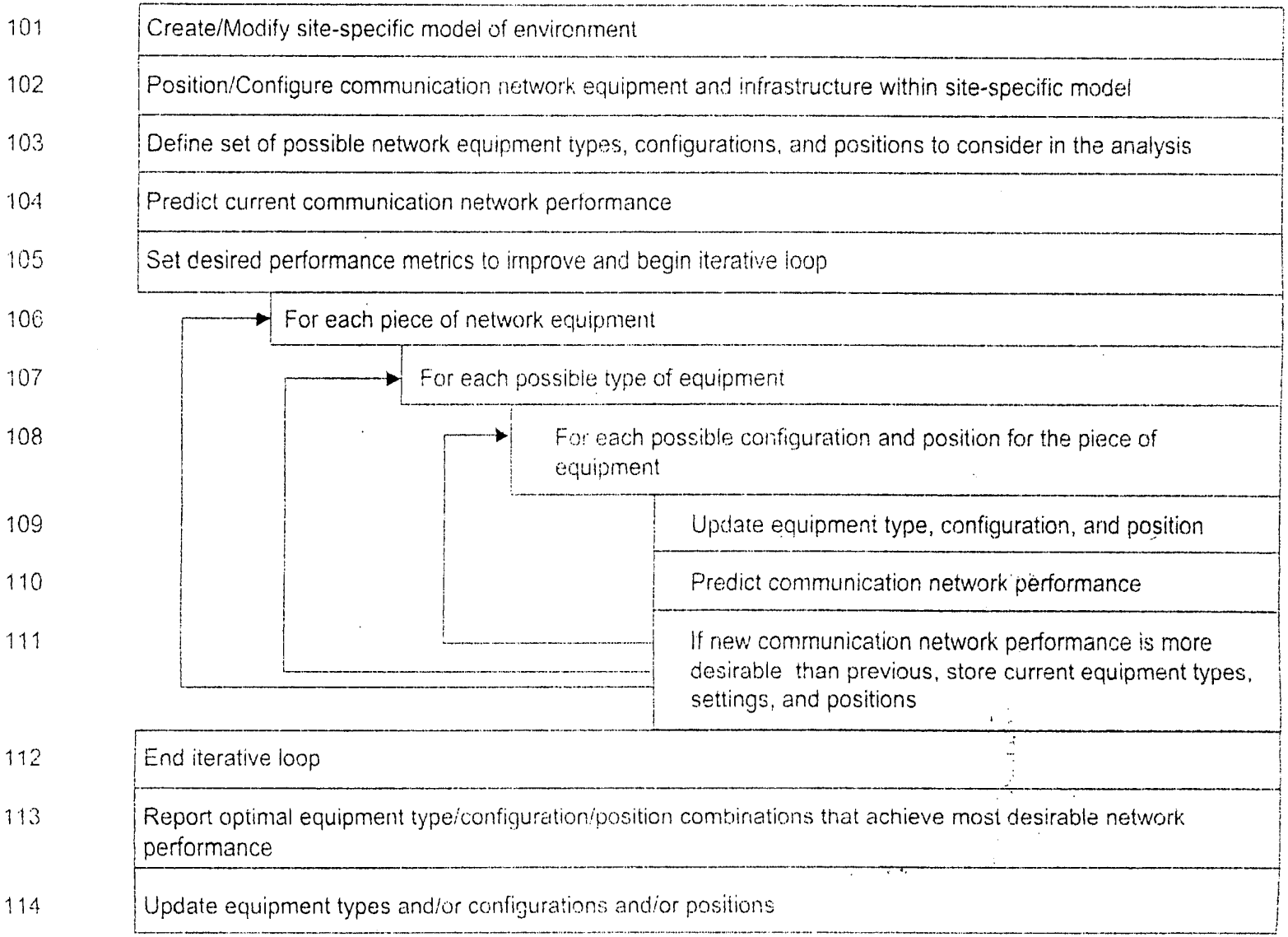

101
Create/Modify site-specific model of environment
102
Position/Configure communication network equipment and infrastructure within site-specific model
103
Define set of possible network equipment types, configurations, and positions to consider in the analysis
104
Predict current communication network performance
105
Set desired performance metrics to improve and begin iterative loop
106
For each piece of network equipment
107
For each possible type of equipment
108
For each possible configuration and position for the piece of equipment
109
Update equipment type, configuration, and position
110
Predict communication network performance
111
If new communication network performance is more desirable than previous, store current equipment types, settings, and positions
112
End iterative loop
113
Report optimal equipment type/configuration/position combinations that achieve most desirable network performance
114
Update equipment types and/or configurations and/or positions

Figure 1

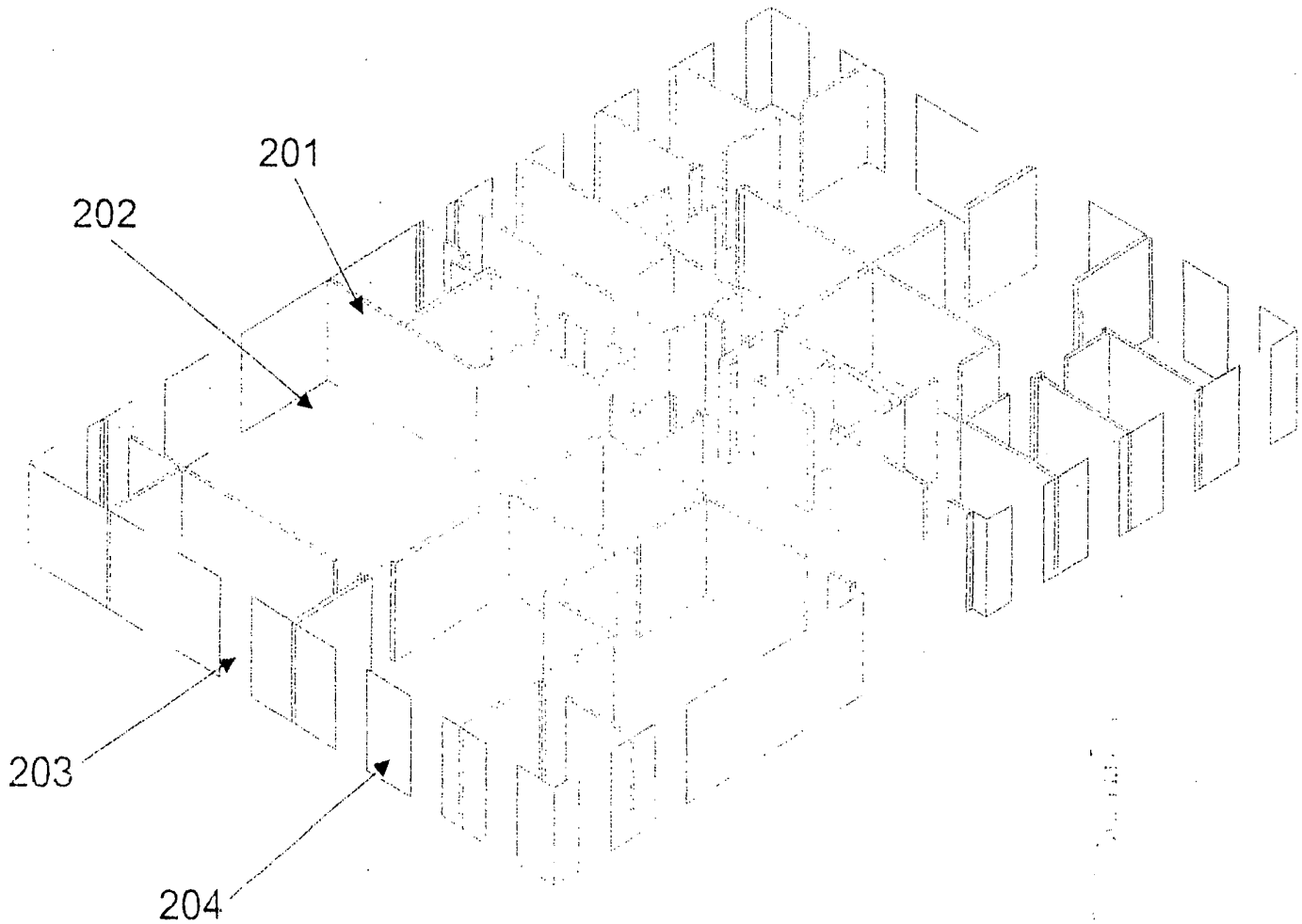
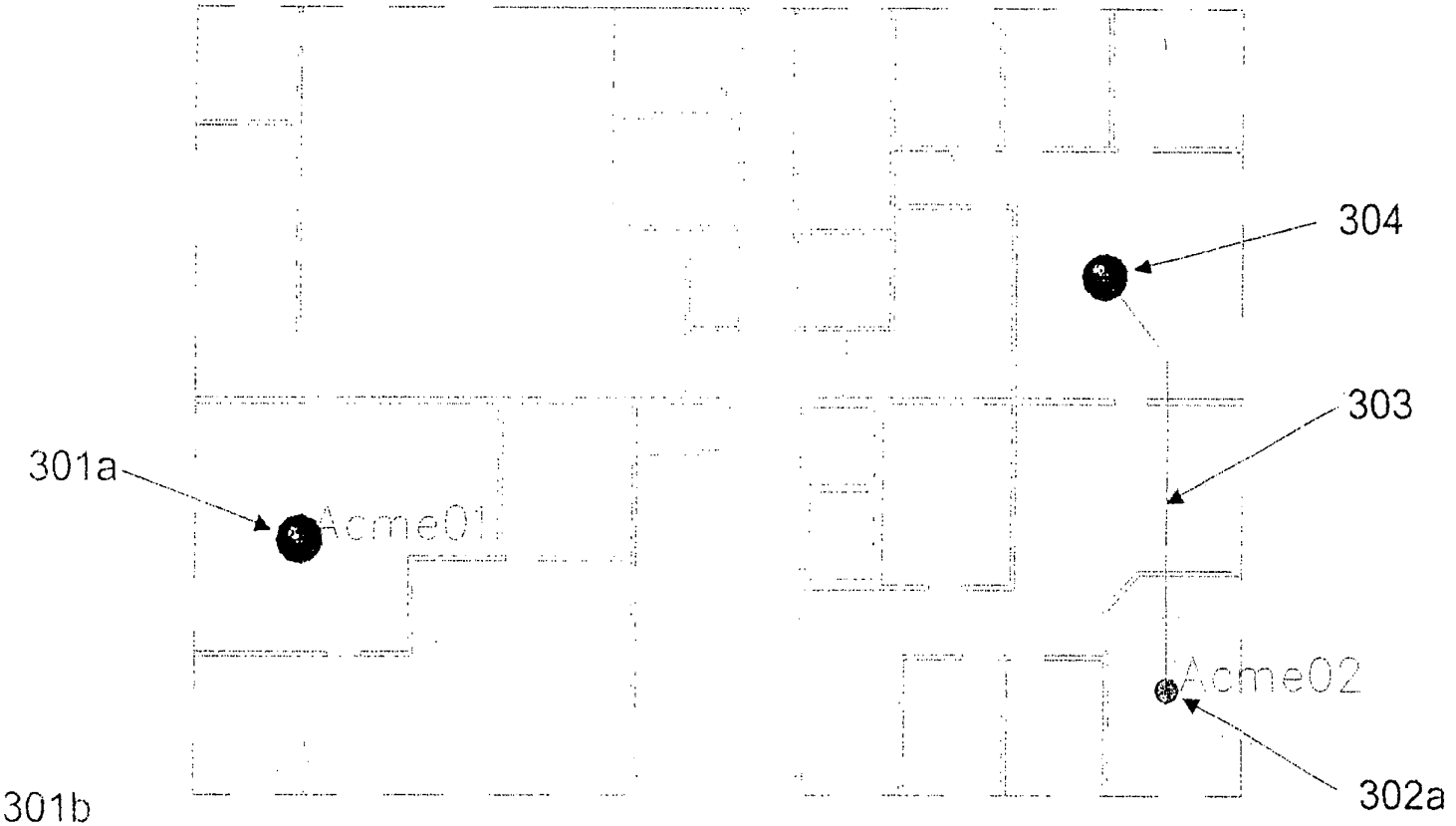


Figure 2



301b

Transceiver:	ACME01
Manufacturer:	Acme
Part Number:	Acme01
Transmit Power:	10 dBm
Channel:	1
Frequency:	2.412 GHz

302b

Transceiver:	ACME02
Manufacturer:	Acme
Part Number:	Acme02
Transmit Power:	10 dBm
Channel:	1
Frequency:	2.412 GHz

Figure 3

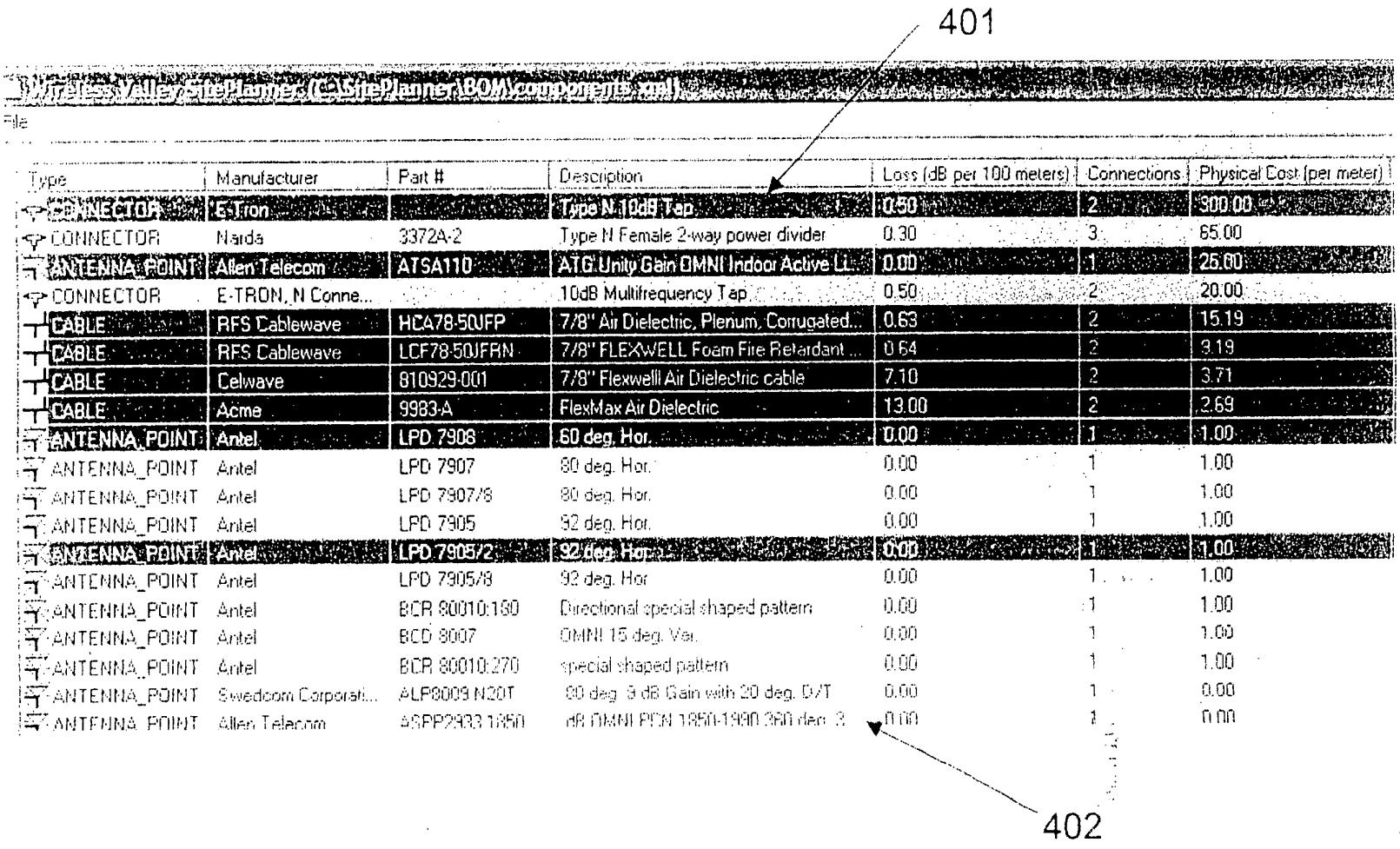

401
Wireless Valley SitePlanner (C:\SitePlanner\BOM\components.xml)
File
Type | Manufacturer | Part # | Description | Loss (dB per 100 meters) | Connections | Physical Cost (per meter)
CONNECTOR | E-Tron | | Type N 10dB Tap | 0.50 | 2 | 300.00
CONNECTOR | Narda | 3372A-2 | Type N Female 2-way power divider | 0.30 | 3 | 65.00
ANTENNA_POINT | Allen Telecom | ATSA110 | ATG Unity Gain OMNI Indoor Active LL... | 0.00 | 1 | 25.00
CONNECTOR | E-TRON, N Conne... | | 10dB Multifrequency Tap | 0.50 | 2 | 20.00
CABLE | RFS Cablewave | HCA78-50JFP | 7/8" Air Dielectric, Plenum, Corrugated... | 0.63 | 2 | 15.19
CABLE | RFS Cablewave | LCF78-50JFRN | 7/8" FLEXWELL Foam Fire Retardant ... | 0.64 | 2 | 3.19
CABLE | Celwave | 810929-001 | 7/8" Flexwell Air Dielectric cable | 7.10 | 2 | 3.71
CABLE | Acme | 9983-A | FlexMax Air Dielectric | 13.00 | 2 | 2.69
ANTENNA_POINT | Antel | LPD 7908 | 60 deg. Hor. | 0.00 | 1 | 1.00
ANTENNA_POINT | Antel | LPD 7907 | 80 deg. Hor. | 0.00 | 1 | 1.00
ANTENNA_POINT | Antel | LPD 7907/8 | 80 deg. Hor. | 0.00 | 1 | 1.00
ANTENNA_POINT | Antel | LPD 7905 | 92 deg. Hor. | 0.00 | 1 | 1.00
ANTENNA_POINT | Antel | LPD 7905/2 | 92 deg. Hor. | 0.00 | 1 | 1.00
ANTENNA_POINT | Antel | LPD 7905/8 | 92 deg. Hor | 0.00 | 1 | 1.00
ANTENNA_POINT | Antel | BCR 80010:180 | Directional special shaped pattern | 0.00 | 1 | 1.00
ANTENNA_POINT | Antel | BCD 8007 | OMNI 15 deg. Ver. | 0.00 | 1 | 1.00
ANTENNA_POINT | Antel | BCR 80010:270 | special shaped pattern | 0.00 | 1 | 1.00
ANTENNA_POINT | Swedcom Corporati... | ALP9009 N20T | 90 deg. 9 dB Gain with 20 deg. D/T | 0.00 | 1 | 0.00
ANTENNA_POINT | Allen Telecom | ASPP2933 1850 | dB OMNI PCN 1850-1990 360 deg. 3 | 0.00 | 1 | 0.00
402

Figure 4

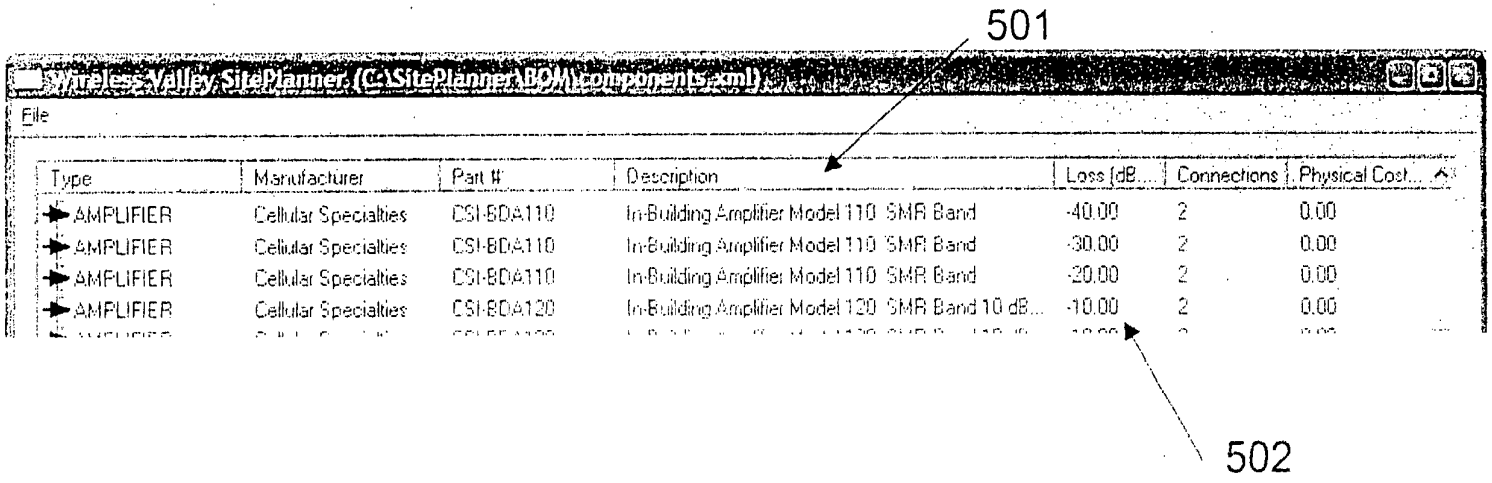

501
Wireless Valley SitePlanner (C:\SitePlanner\BOM\components.xml)
File
Type
Manufacturer
Part #
Description
Loss [dB...
Connections
Physical Cost...
AMPLIFIER
Cellular Specialties
CSI-BDA110
In-Building Amplifier Model 110 SMR Band
-40.00
2
0.00
AMPLIFIER
Cellular Specialties
CSI-BDA110
In-Building Amplifier Model 110 SMR Band
-30.00
2
0.00
AMPLIFIER
Cellular Specialties
CSI-BDA110
In-Building Amplifier Model 110 SMR Band
-20.00
2
0.00
AMPLIFIER
Cellular Specialties
CSI-BDA120
In-Building Amplifier Model 120 SMR Band 10 dB...
-10.00
2
0.00
502

Figure 5

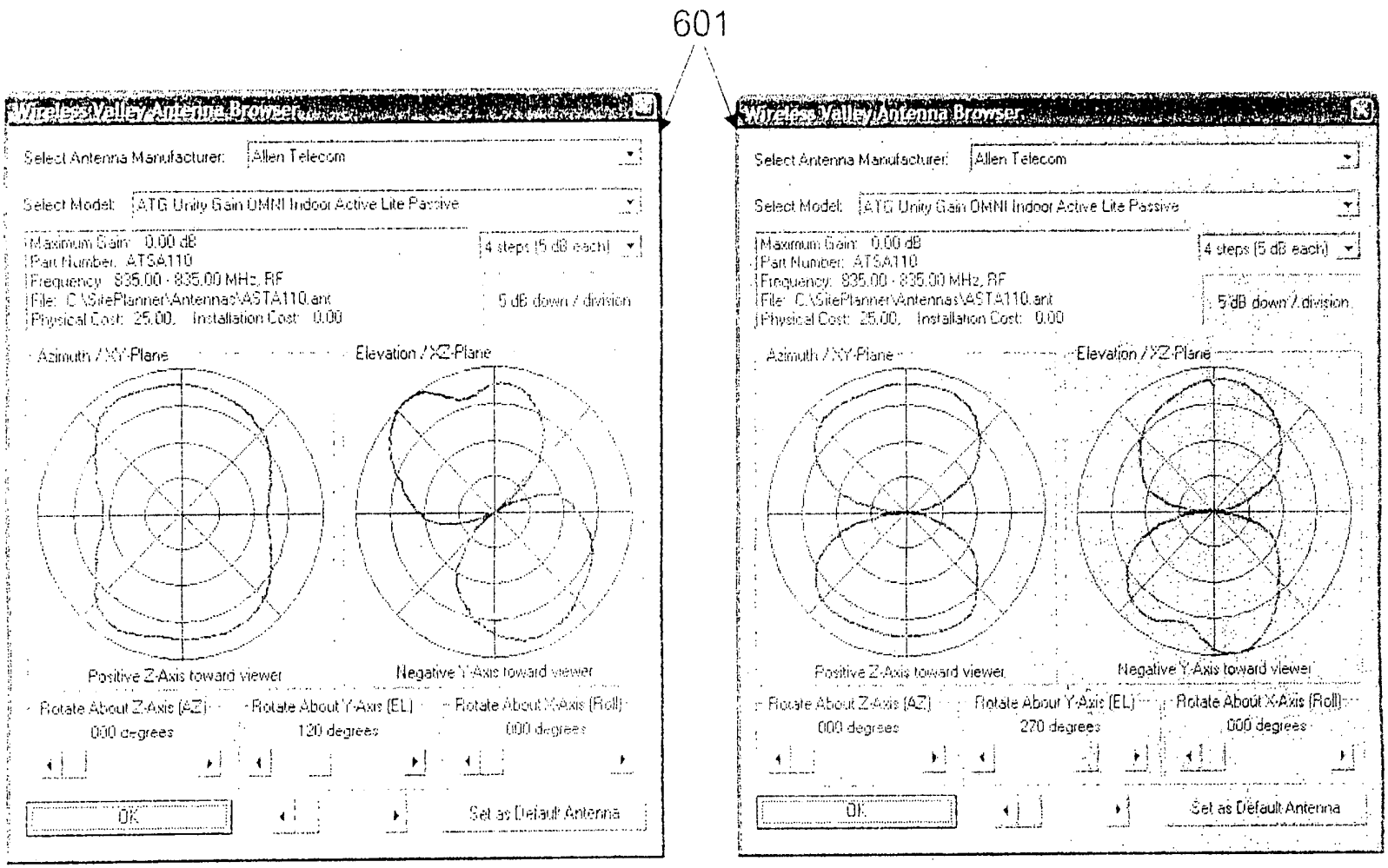

601
Wireless Valley Antenna Browser
Select Antenna Manufacturer:
Allen Telecom
Select Model:
ATG Unity Gain OMNI Indoor Active Lite Passive
Maximum Gain: 0.00 dB
Part Number: ATSA110
Frequency: 835.00 - 835.00 MHz, RF
File: C:\SitePlanner\Antennas\ASTA110.ant
Physical Cost: 25.00, Installation Cost: 0.00
4 steps (5 dB each)
5 dB down / division
Azimuth / XY-Plane
Elevation / XZ-Plane
Positive Z-Axis toward viewer
Negative Y-Axis toward viewer
Rotate About Z-Axis (AZ)
000 degrees
Rotate About Y-Axis (EL)
120 degrees
Rotate About X-Axis (Roll)
000 degrees
OK
Set as Default Antenna
Wireless Valley Antenna Browser
Select Antenna Manufacturer:
Allen Telecom
Select Model:
ATG Unity Gain OMNI Indoor Active Lite Passive
Maximum Gain: 0.00 dB
Part Number: ATSA110
Frequency: 835.00 - 835.00 MHz, RF
File: C:\SitePlanner\Antennas\ASTA110.ant
Physical Cost: 25.00, Installation Cost: 0.00
4 steps (5 dB each)
5 dB down / division
Azimuth / XY-Plane
Elevation / XZ-Plane
Positive Z-Axis toward viewer
Negative Y-Axis toward viewer
Rotate About Z-Axis (AZ)
000 degrees
Rotate About Y-Axis (EL)
270 degrees
Rotate About X-Axis (Roll)
000 degrees
OK
Set as Default Antenna

Figure 6

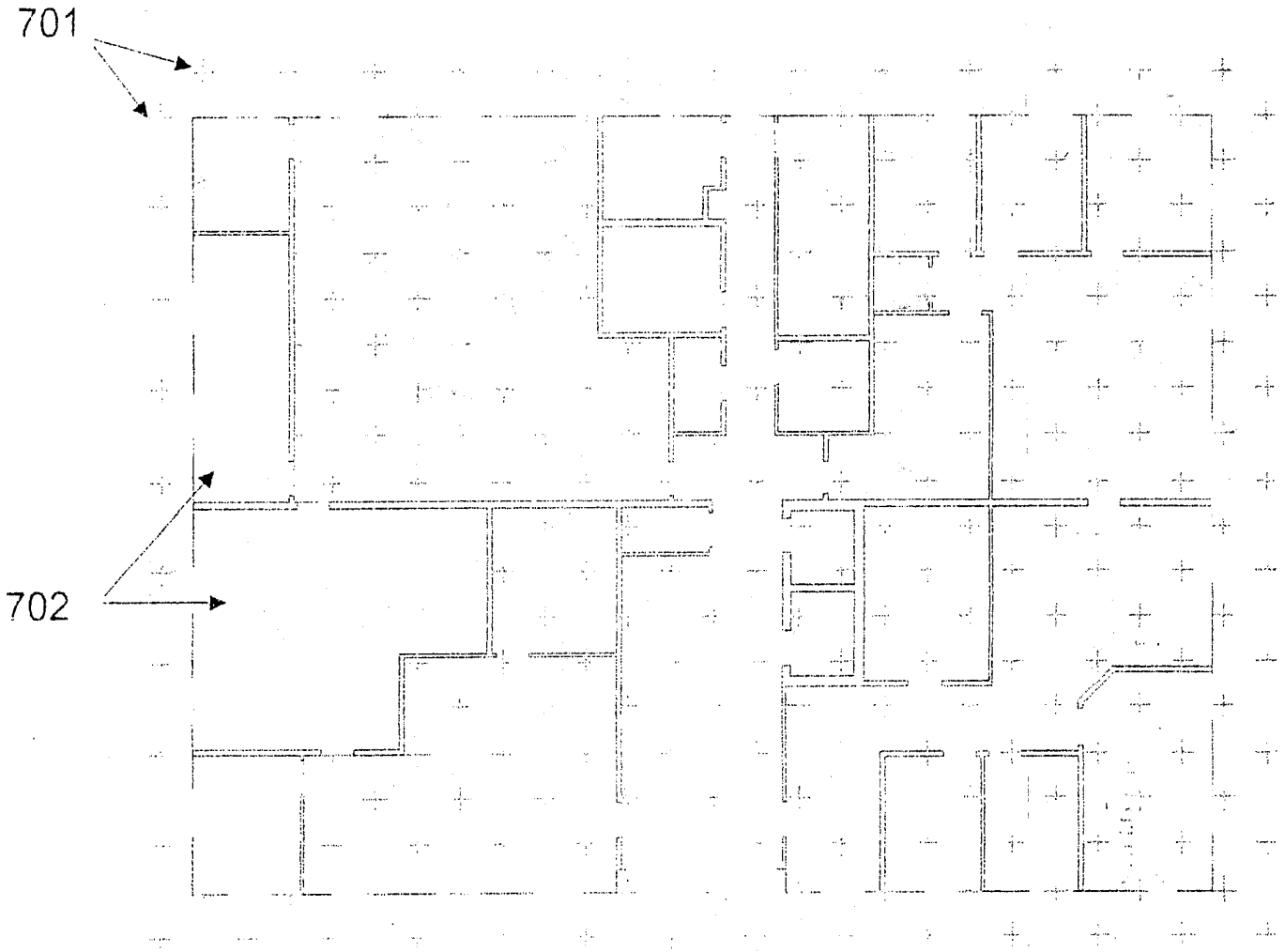


Figure 7

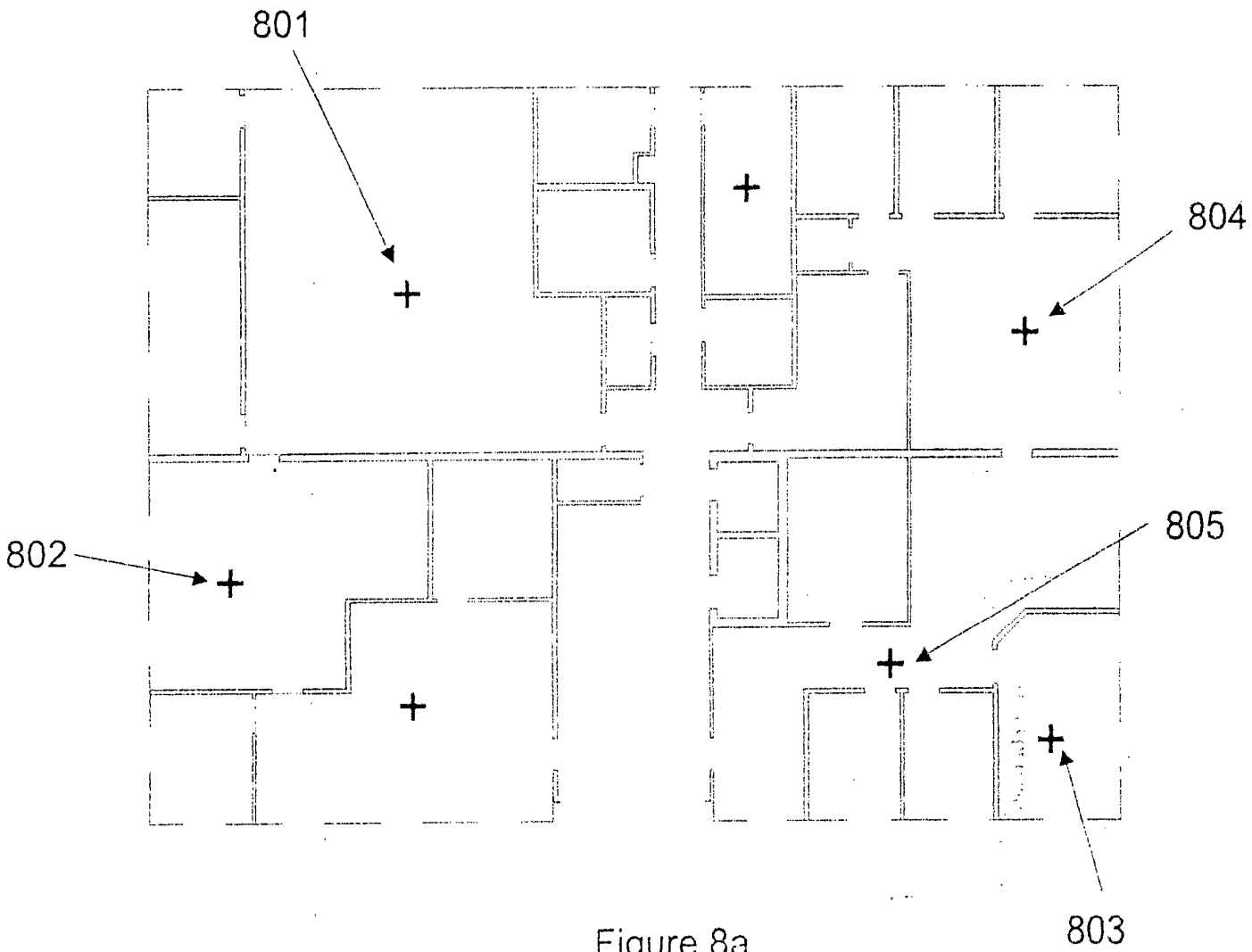


Figure 8a

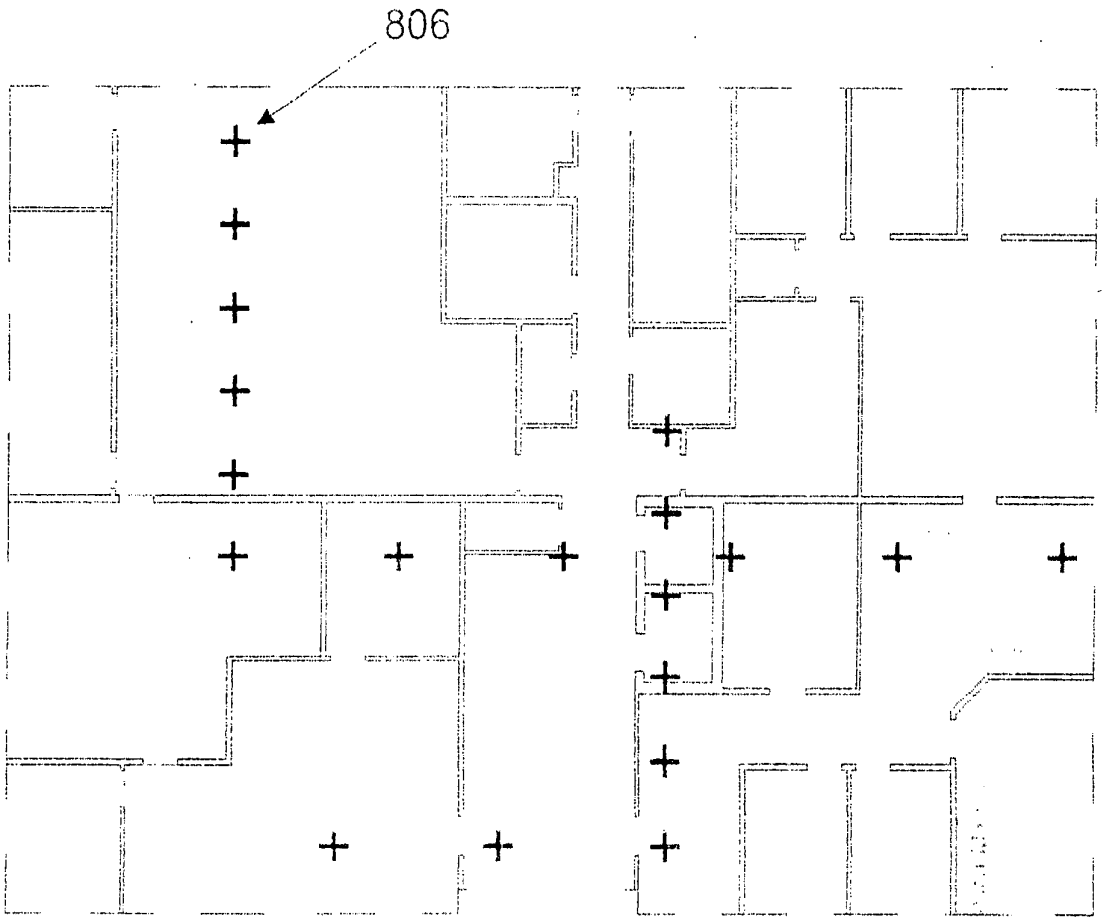


Figure 8b

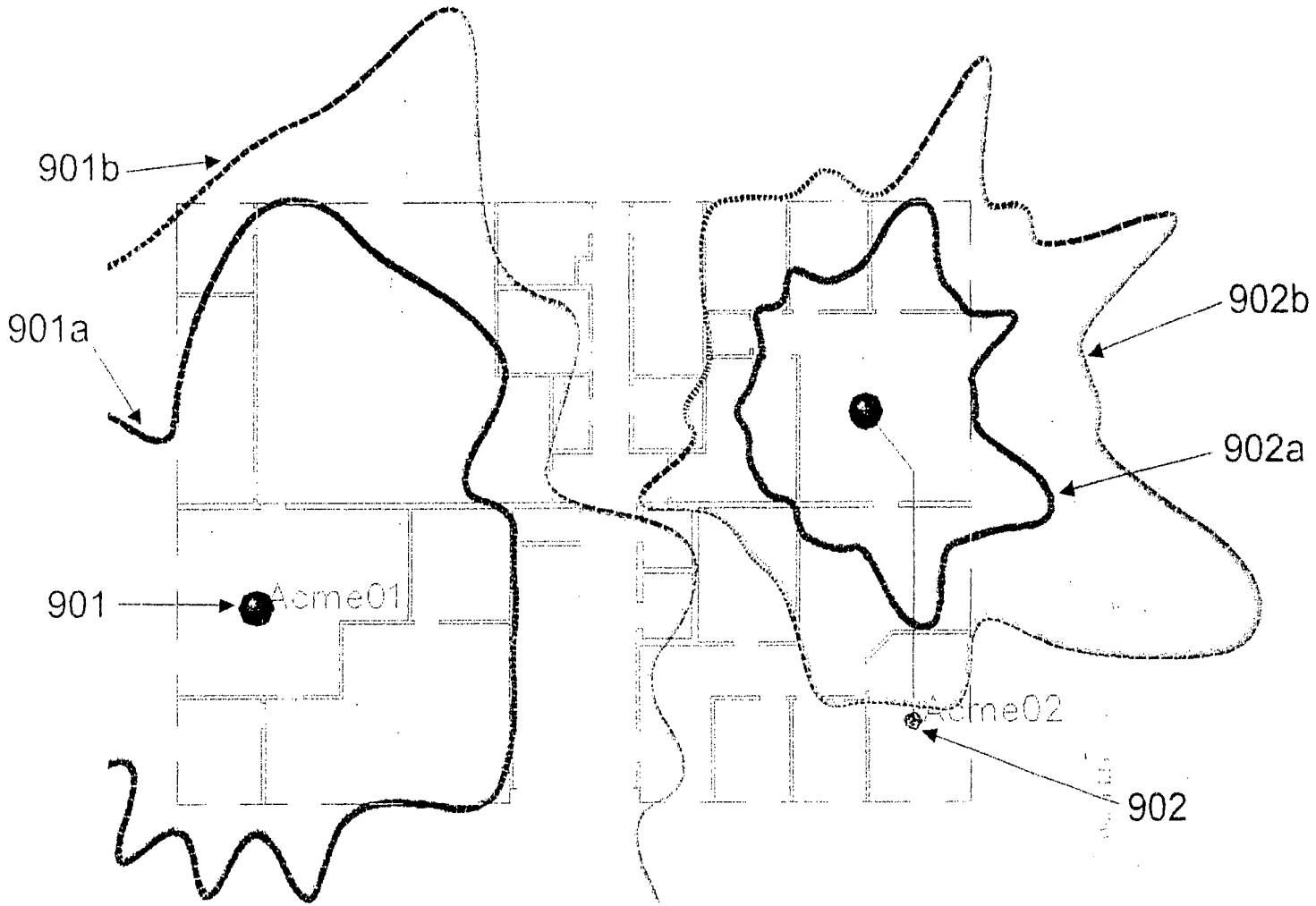


Figure 9

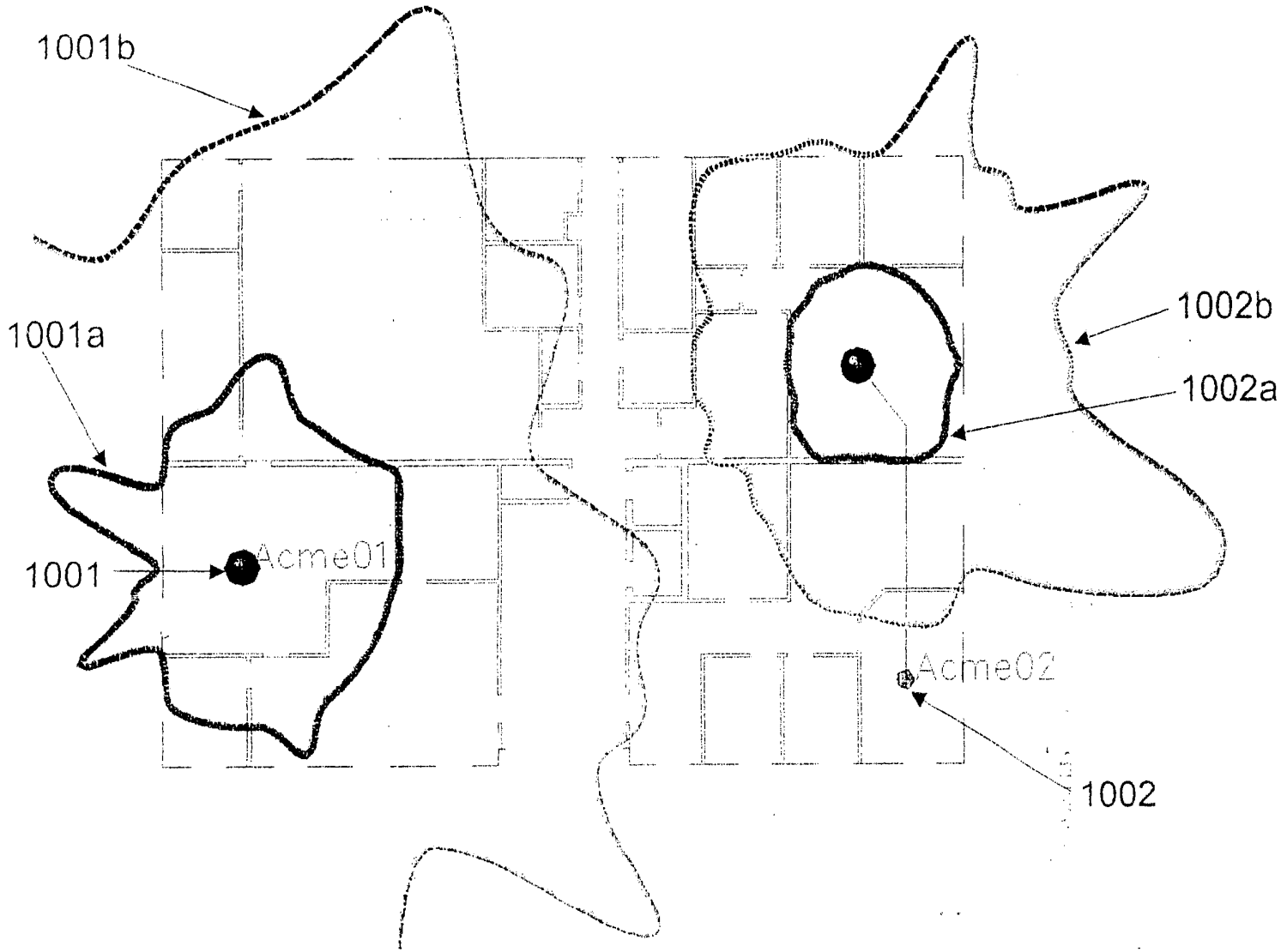


Figure 10

1101

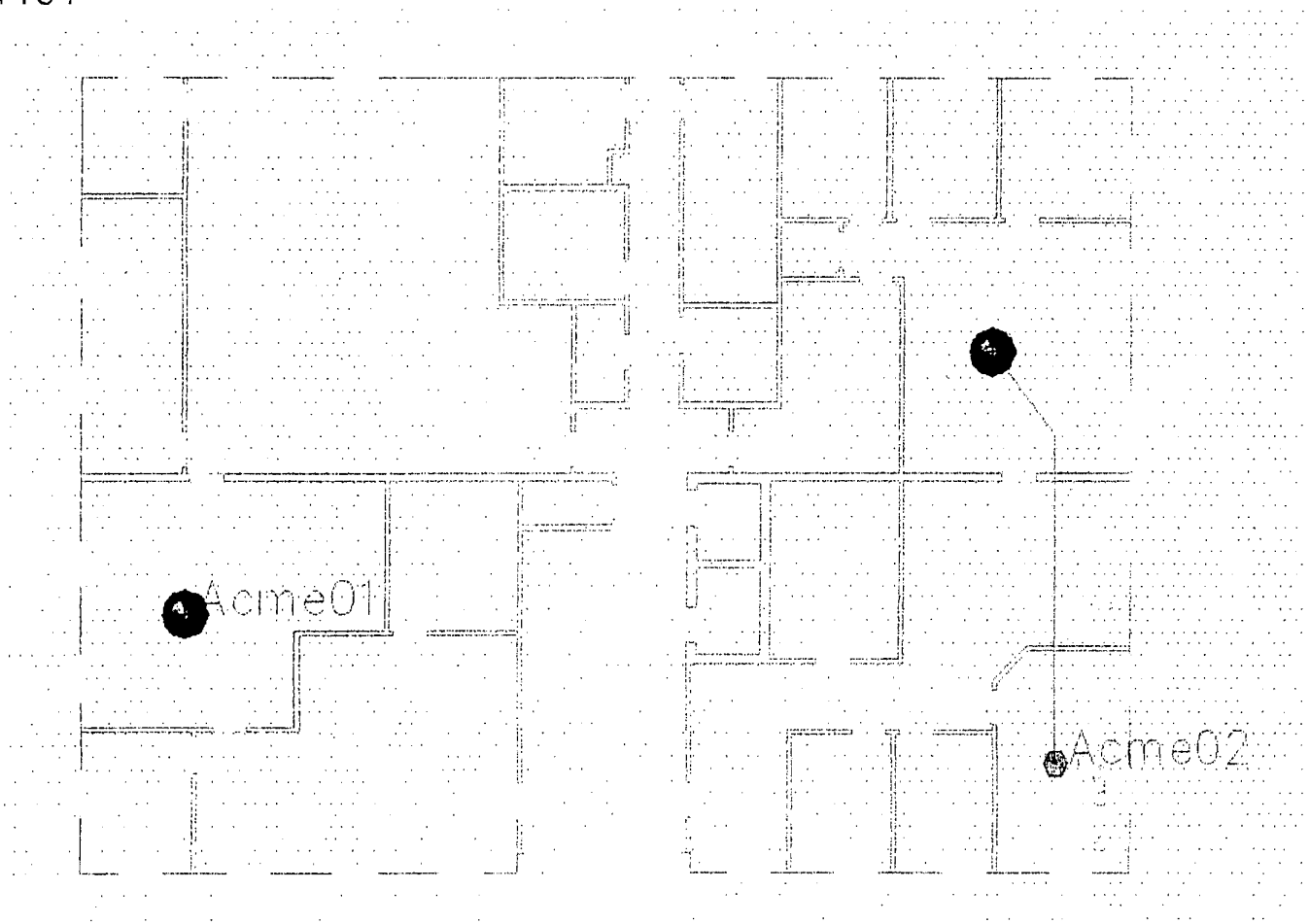
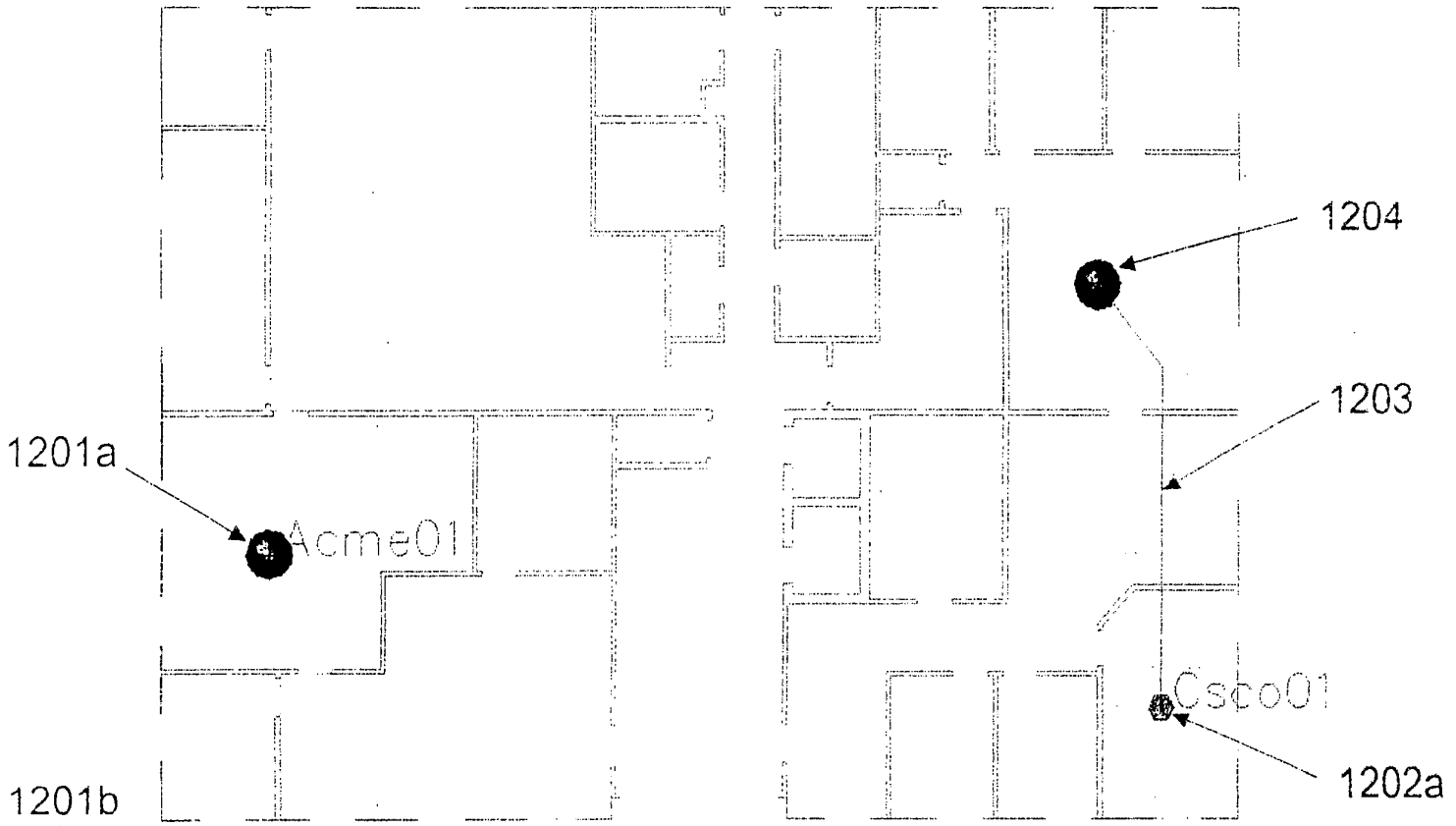


Figure 11



Transceiver:	ACME01
Manufacturer:	Acme
Part Number:	Acme01
Transmit Power:	7 dBm
Channel:	1
Frequency:	2.412 GHz

Transceiver:	CSCO01
Manufacturer:	Csco
Part Number:	Csco01
Transmit Power:	15 dBm
Channel:	6
Frequency:	2.437 GHz

Figure 12

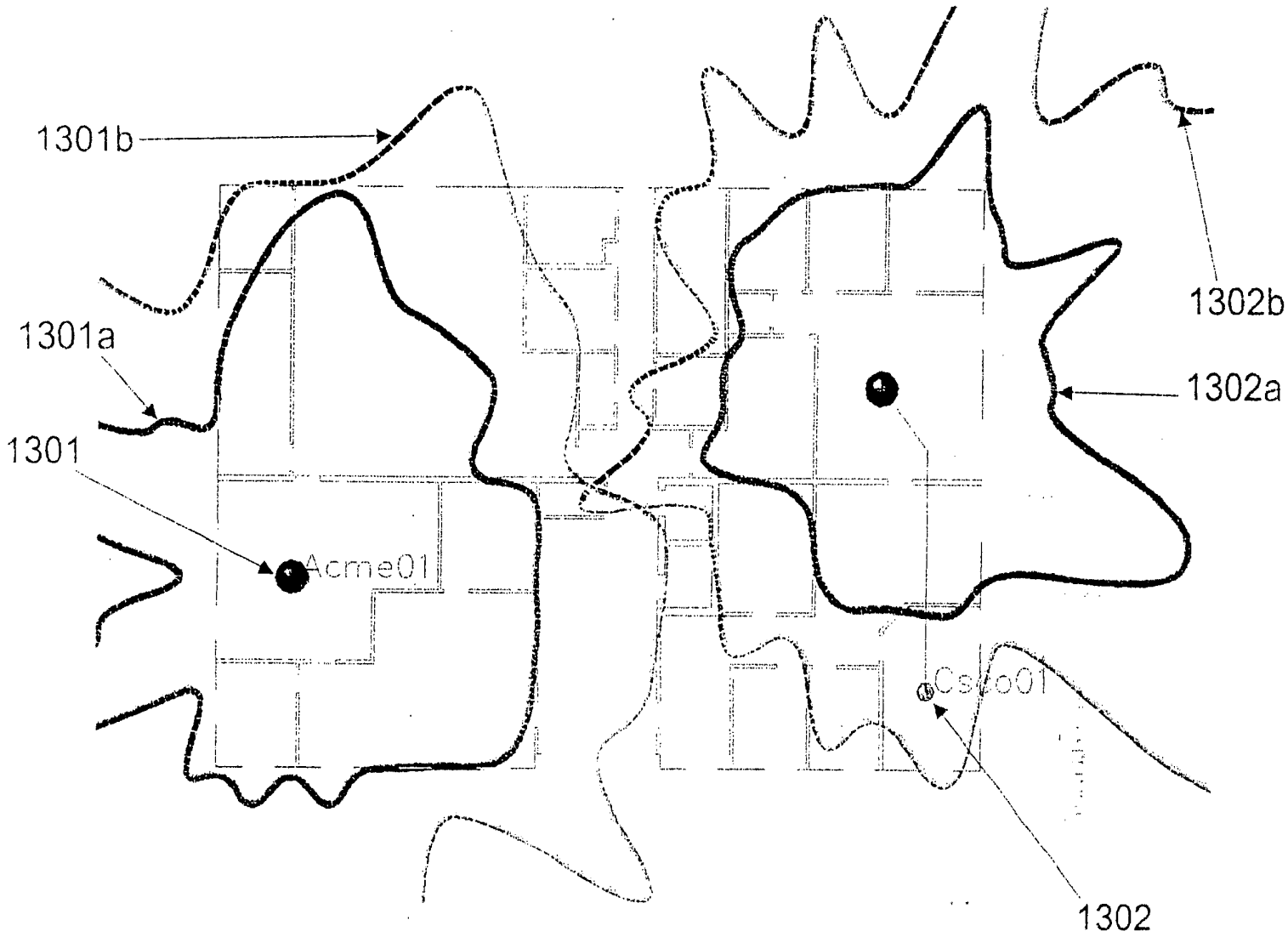


Figure 13

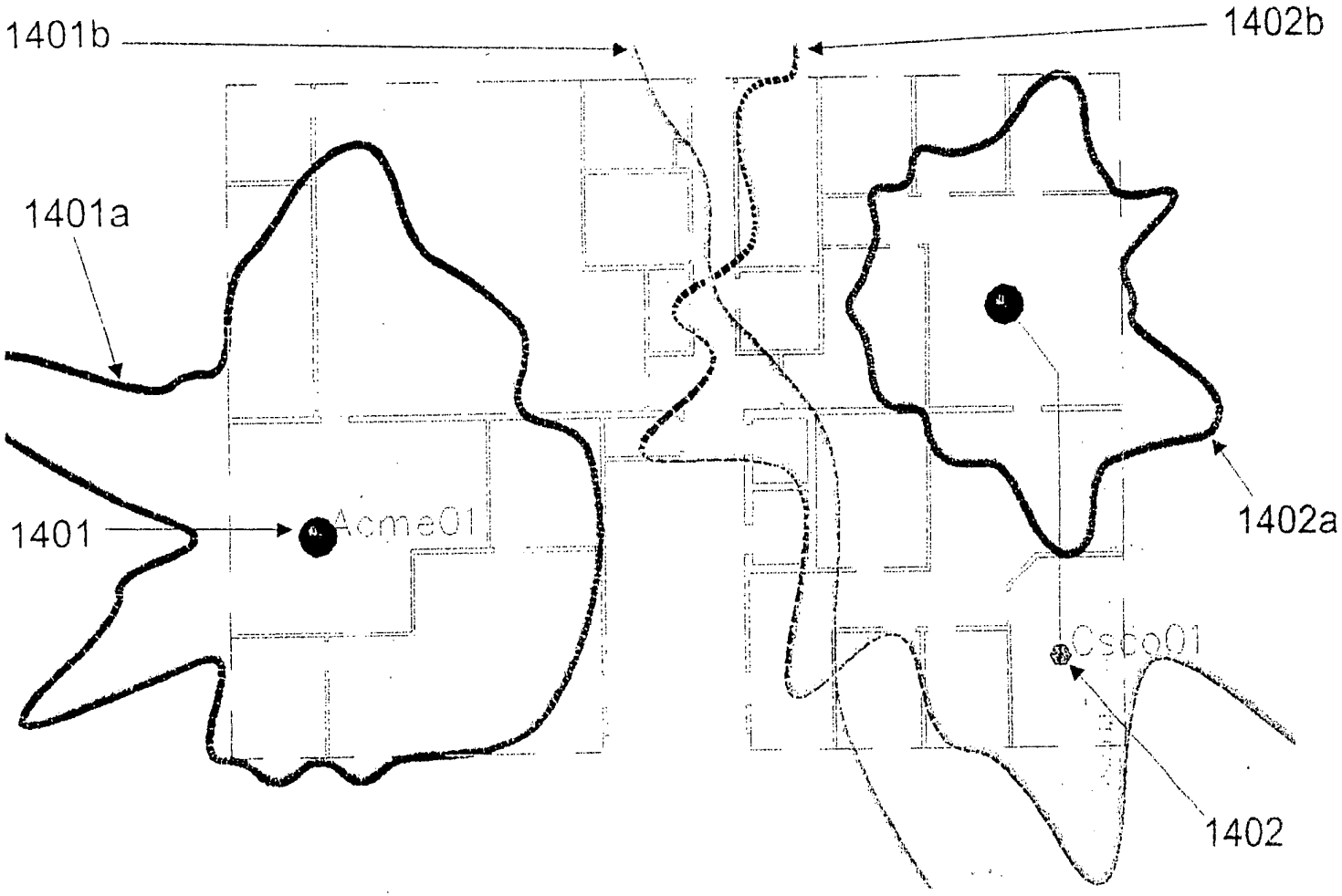


Figure 14

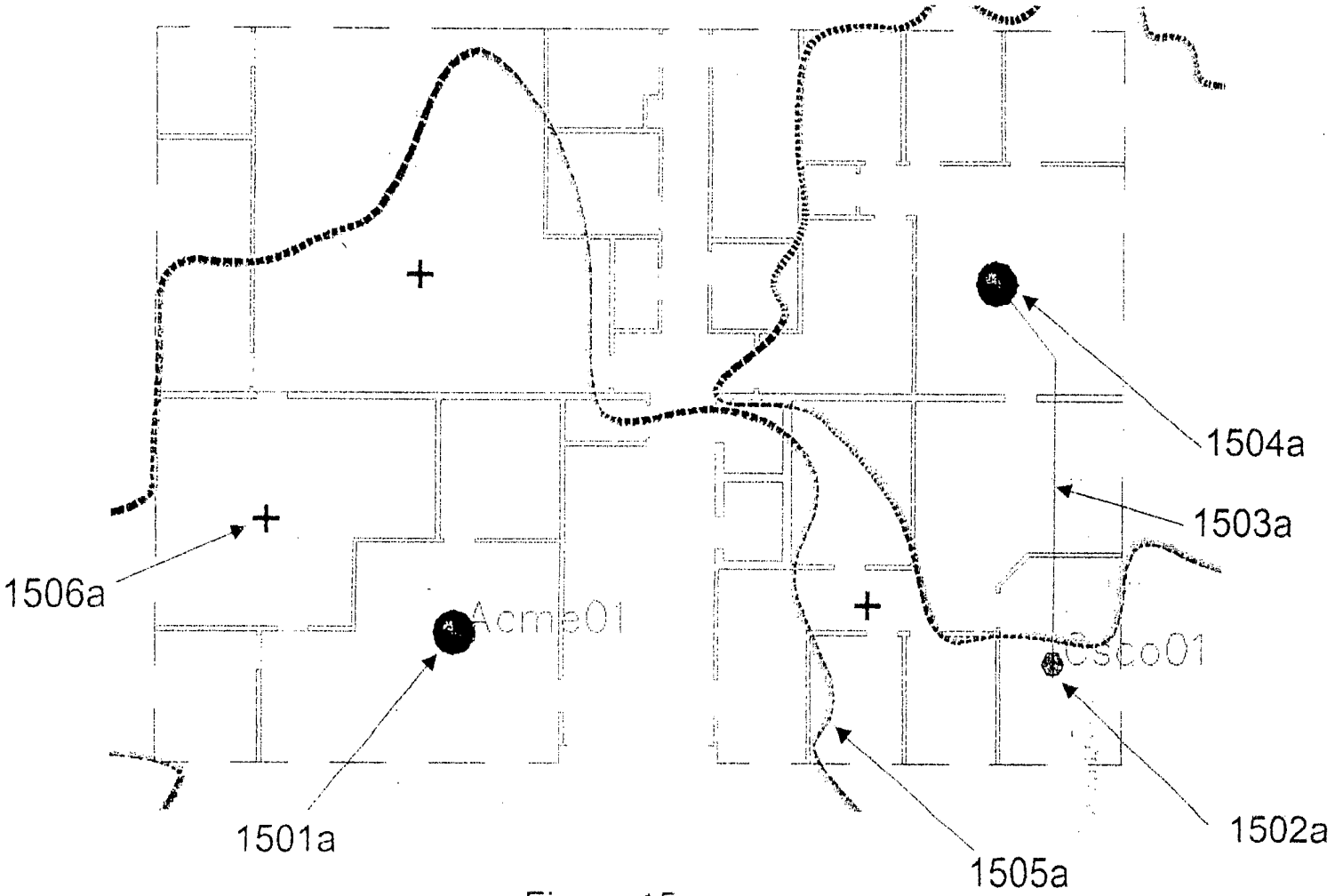


Figure 15a

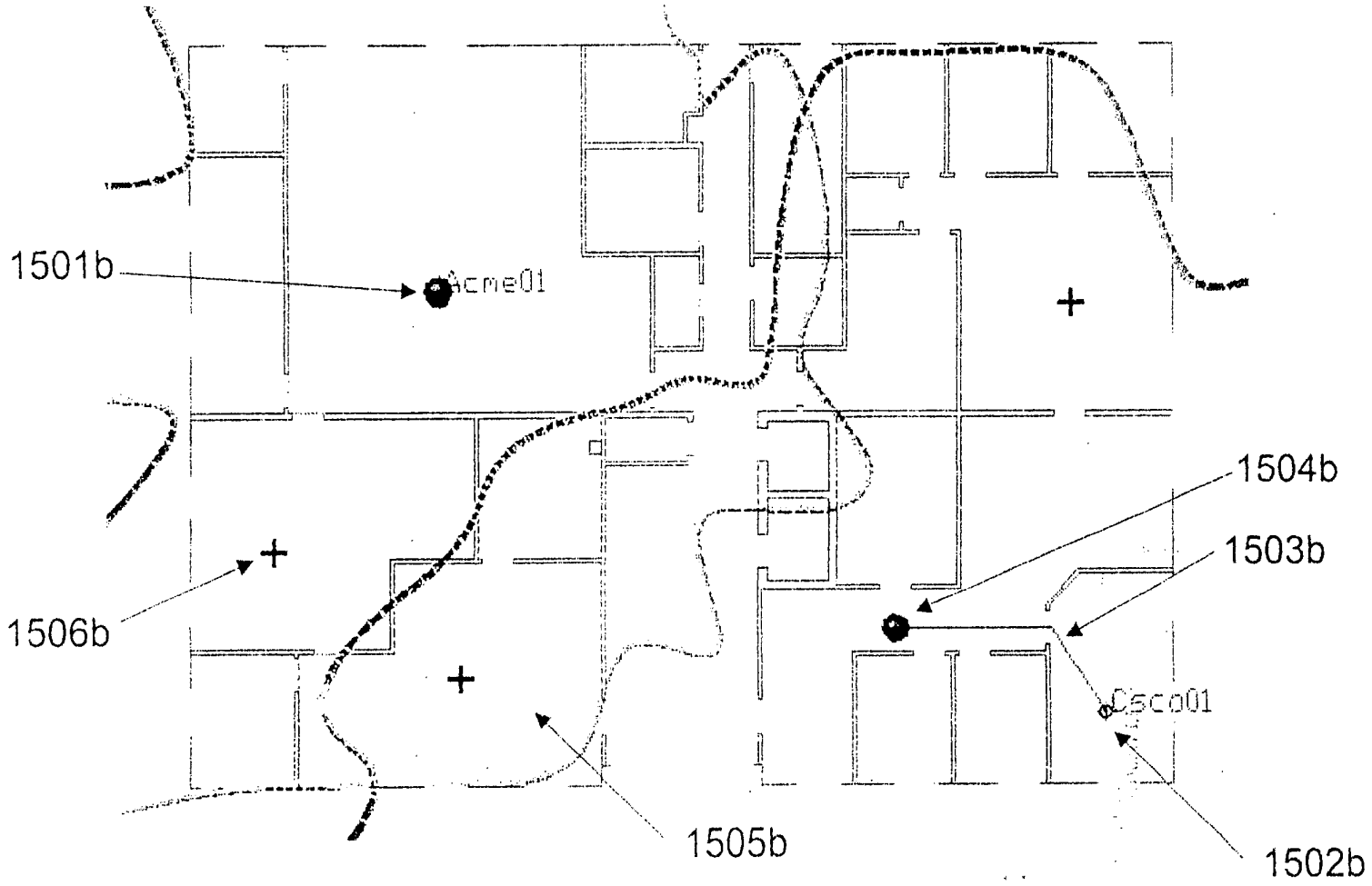


Figure 15b

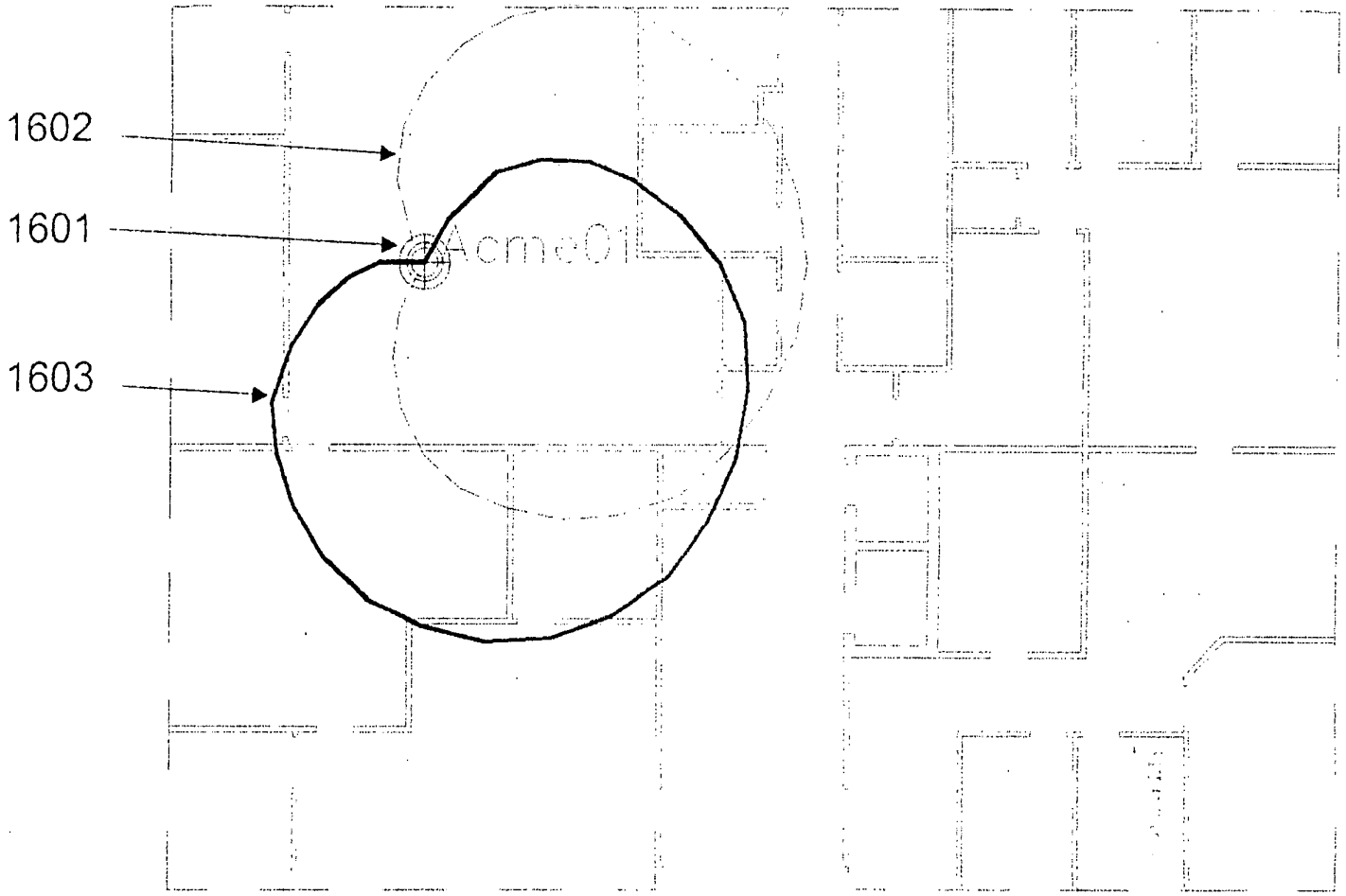


Figure 16

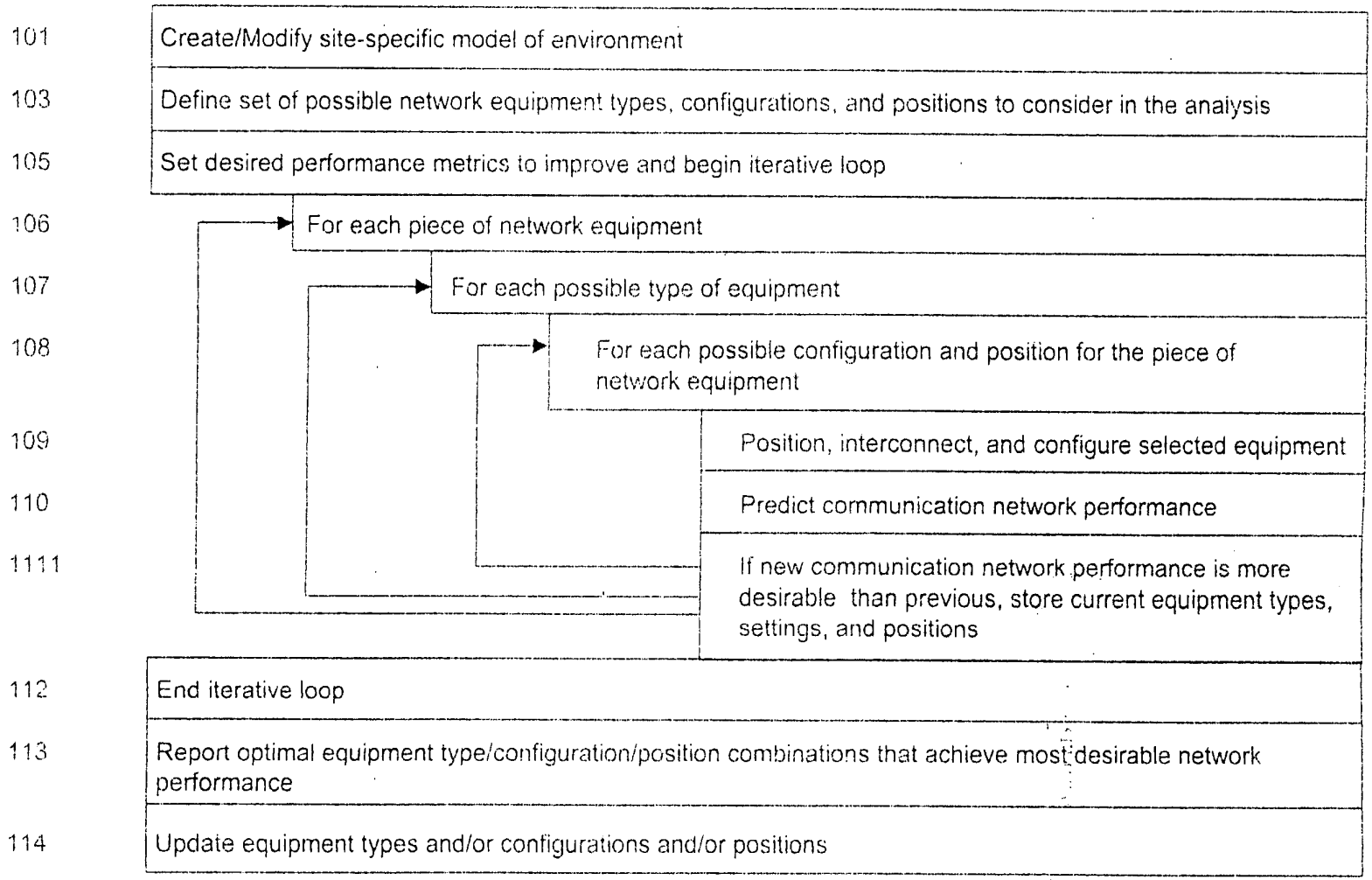

101
Create/Modify site-specific model of environment
103
Define set of possible network equipment types, configurations, and positions to consider in the analysis
105
Set desired performance metrics to improve and begin iterative loop
106
For each piece of network equipment
107
For each possible type of equipment
108
For each possible configuration and position for the piece of network equipment
109
Position, interconnect, and configure selected equipment
110
Predict communication network performance
1111
If new communication network performance is more desirable than previous, store current equipment types, settings, and positions
112
End iterative loop
113
Report optimal equipment type/configuration/position combinations that achieve most desirable network performance
114
Update equipment types and/or configurations and/or positions

Figure 17

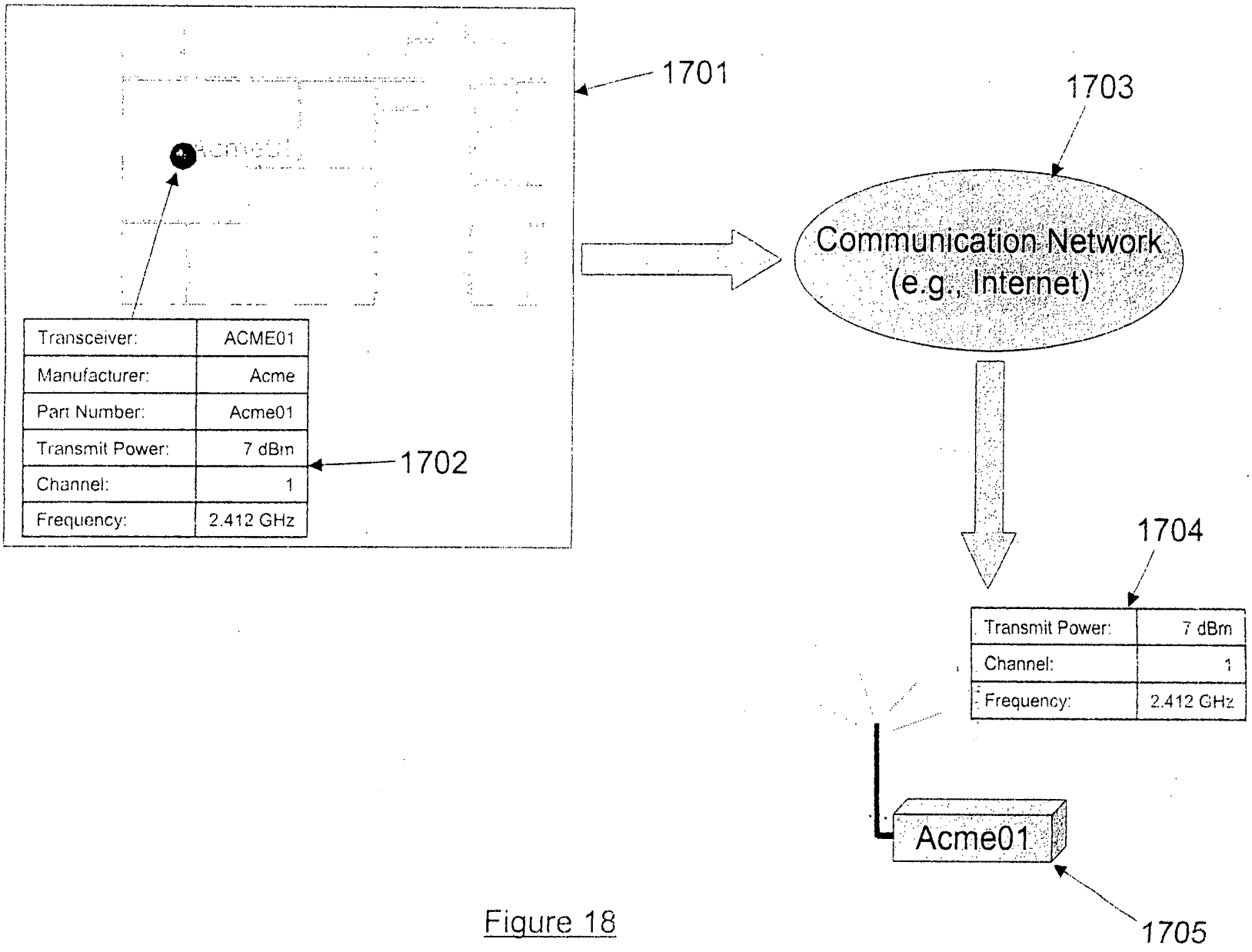

1701
1703
Communication Network
(e.g., Internet)
Transceiver: ACME01
Manufacturer: Acme
Part Number: Acme01
Transmit Power: 7 dBm
Channel: 1
Frequency: 2.412 GHz
1702
1704
Transmit Power: 7 dBm
Channel: 1
Frequency: 2.412 GHz
Acme01
1705

Figure 18

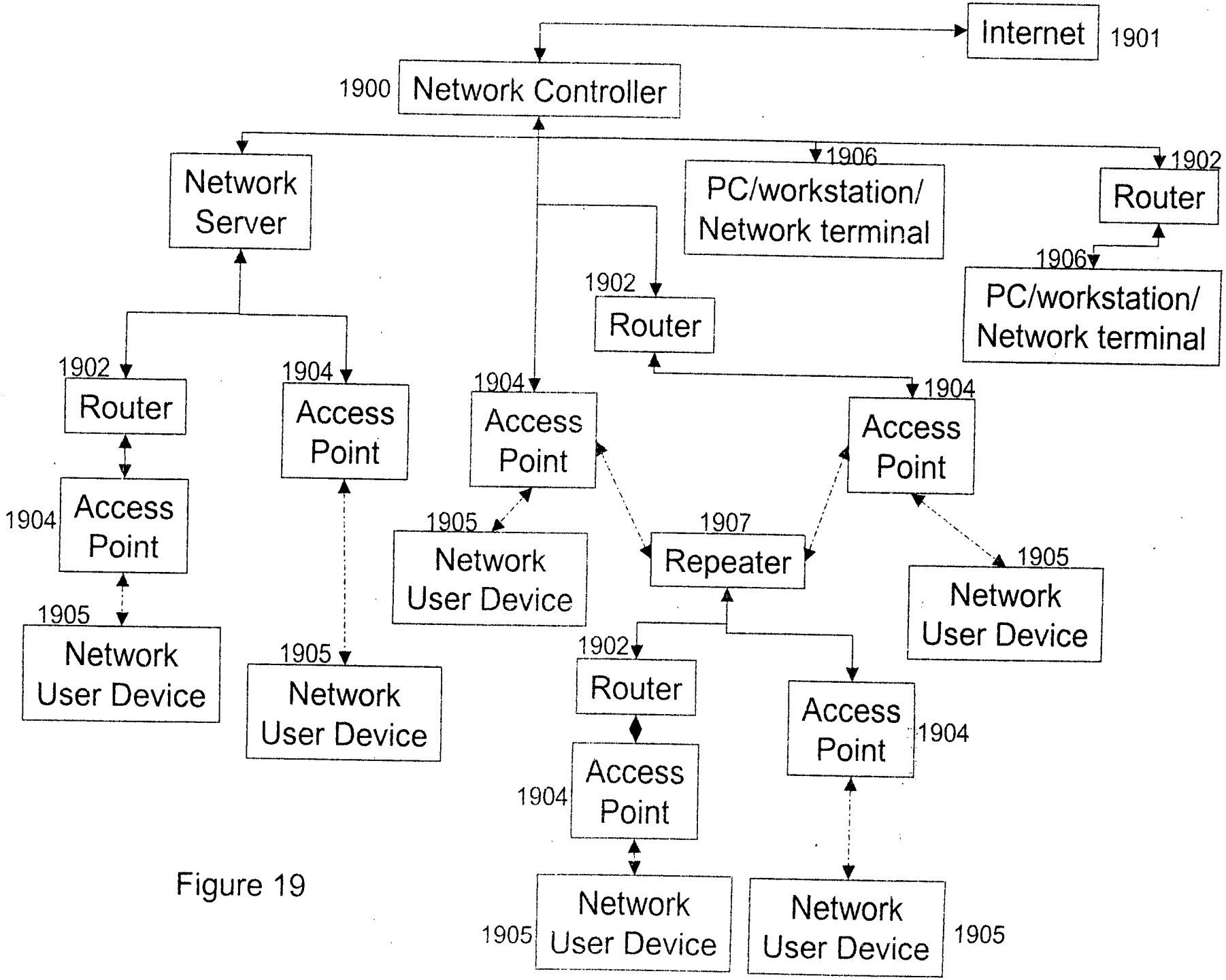

Internet
1901
1900
Network Controller
Network Server
1906
PC/workstation/ Network terminal
1902
Router
1906
PC/workstation/ Network terminal
1902
Router
1902
Router
1904
Access Point
1904
Access Point
1904
Access Point
1904
Access Point
1905
Network User Device
1907
Repeater
1905
Network User Device
1905
Network User Device
1905
Network User Device
1902
Router
1904
Access Point
1904
Access Point
1905
Network User Device
1905
Network User Device

Figure 19

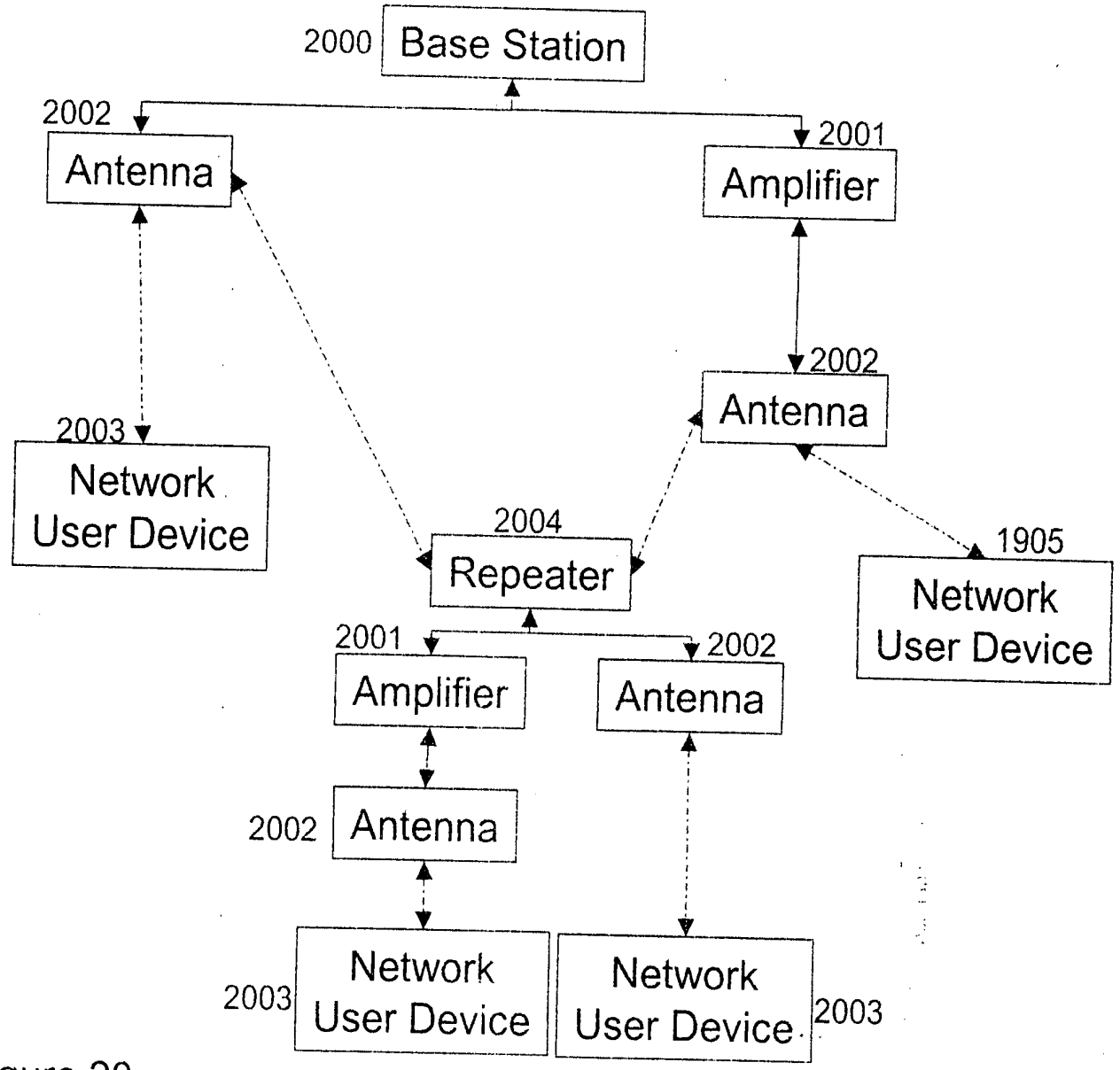

2000
Base Station
2002
Antenna
2001
Amplifier
2003
Network
User Device
2002
Antenna
2004
Repeater
1905
Network
User Device
2001
Amplifier
2002
Antenna
2002
Antenna
2003
Network
User Device
Network
User Device
2003

Figure 20

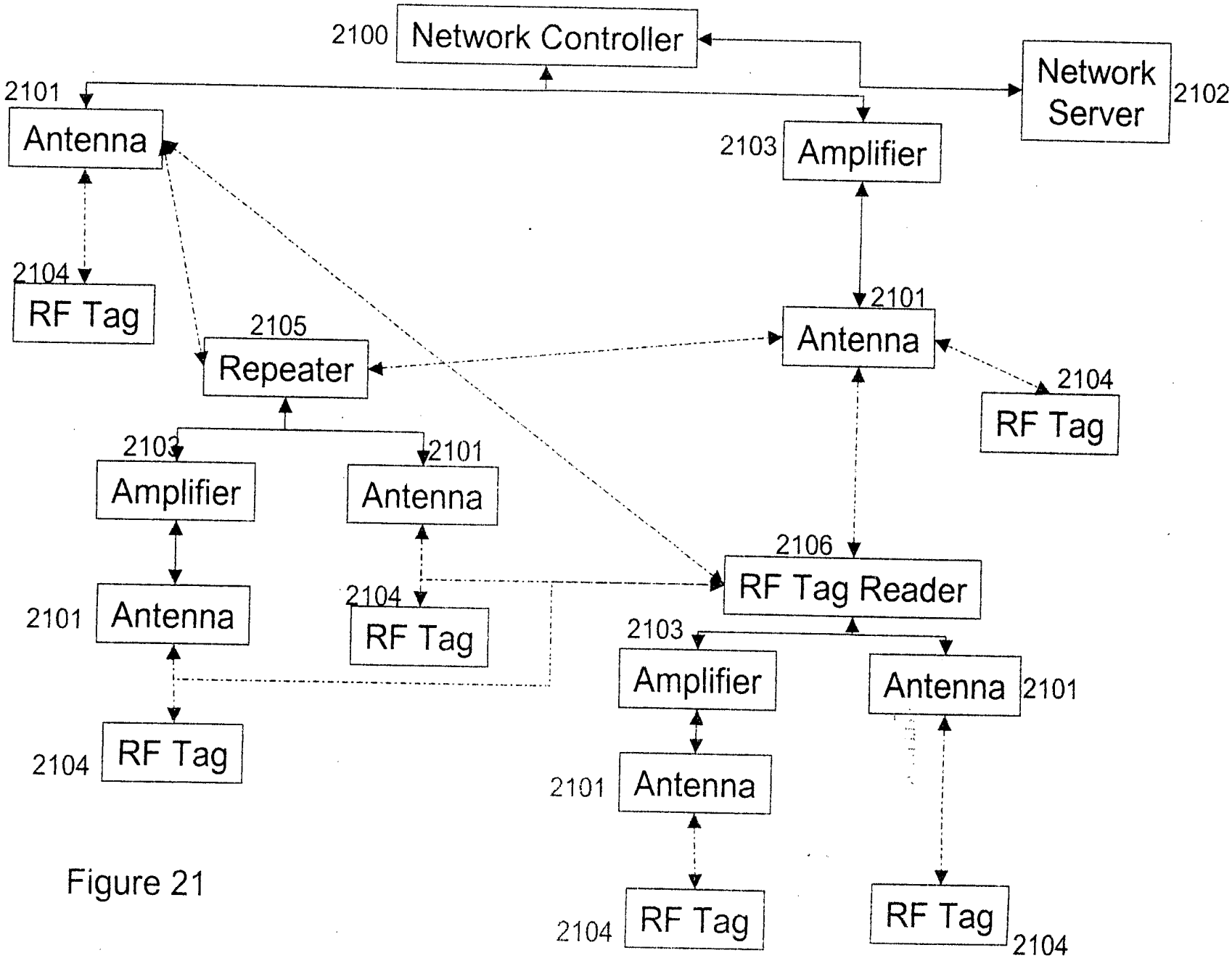

2100
Network Controller
Network Server
2102
2101
Antenna
2103
Amplifier
2104
RF Tag
2105
Repeater
2101
Antenna
2104
RF Tag
2103
Amplifier
2101
Antenna
2106
RF Tag Reader
2101
Antenna
2104
RF Tag
2103
Amplifier
Antenna
2101
2104
RF Tag
2101
Antenna
2104
RF Tag
2104
RF Tag

Figure 21

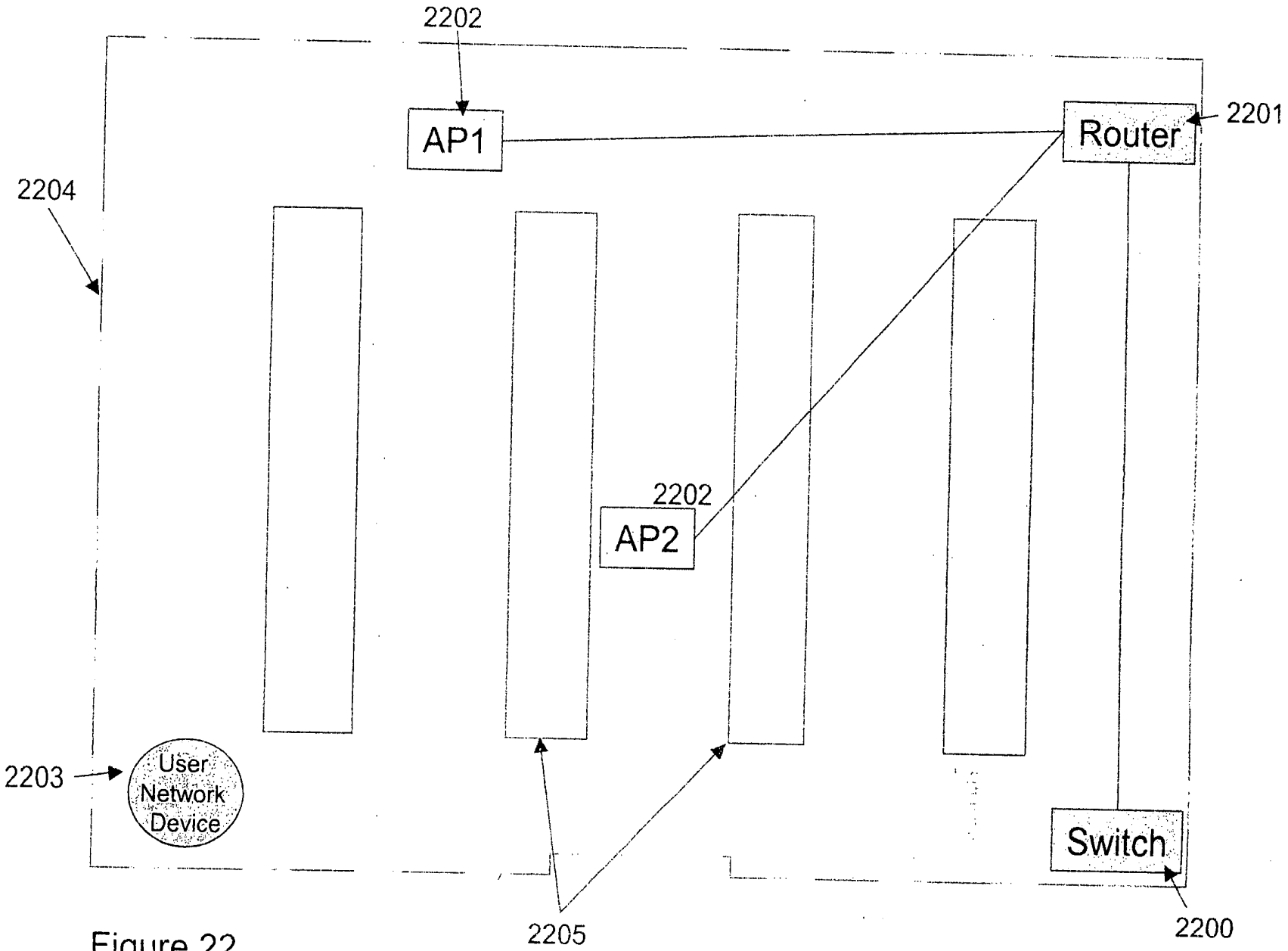

2202
AP1
Router
2201
2204
2202
AP2
2203
User
Network
Device
Switch
2205
2200

Figure 22

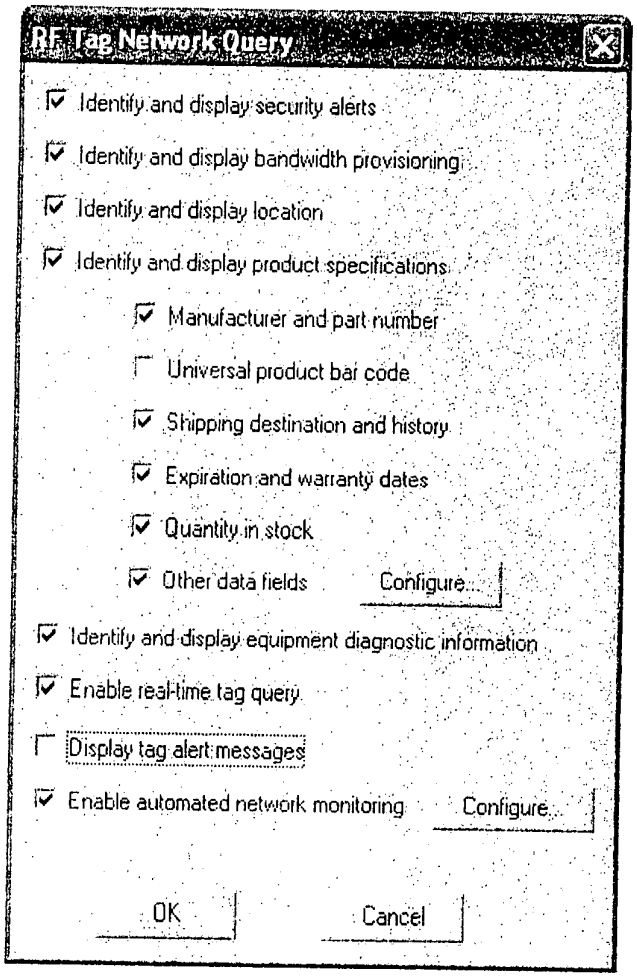

RF Tag Network Query
Identify and display security alerts
Identify and display bandwidth provisioning
Identify and display location
Identify and display product specifications
Manufacturer and part number
Universal product bar code
Shipping destination and history
Expiration and warranty dates
Quantity in stock
Other data fields
Configure...
Identify and display equipment diagnostic information
Enable real-time tag query
Display tag alert messages
Enable automated network monitoring
Configure...
OK
Cancel

Figure 23a

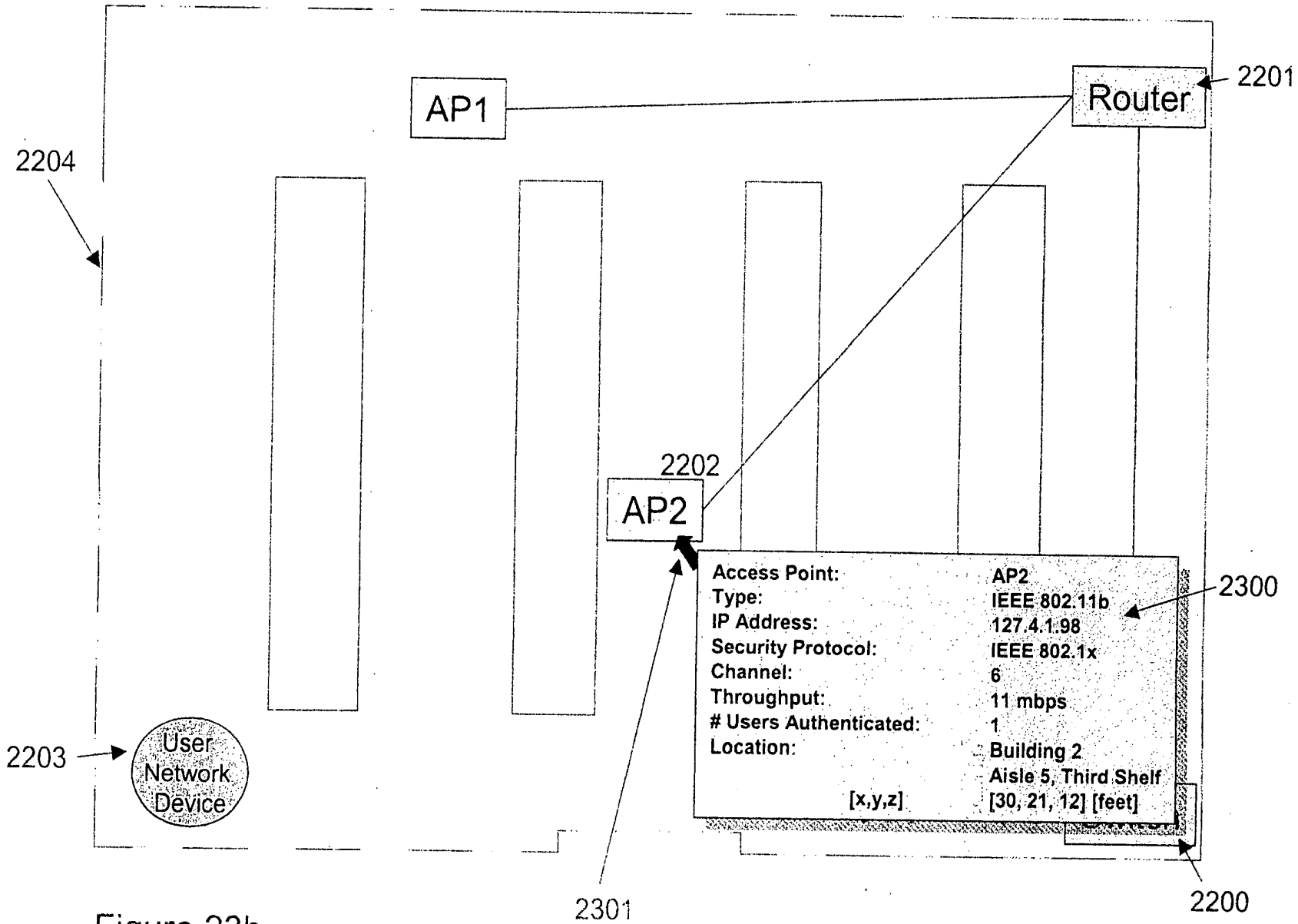

AP1
Router
2201
2204
2202
AP2
Access Point: AP2
Type: IEEE 802.11b
IP Address: 127.4.1.98
Security Protocol: IEEE 802.1x
Channel: 6
Throughput: 11 mbps
Users Authenticated: 1
Location: Building 2
Aisle 5, Third Shelf
[x,y,z] [30, 21, 12] [feet]
2300
2203
User Network Device
2301
2200

Figure 23b

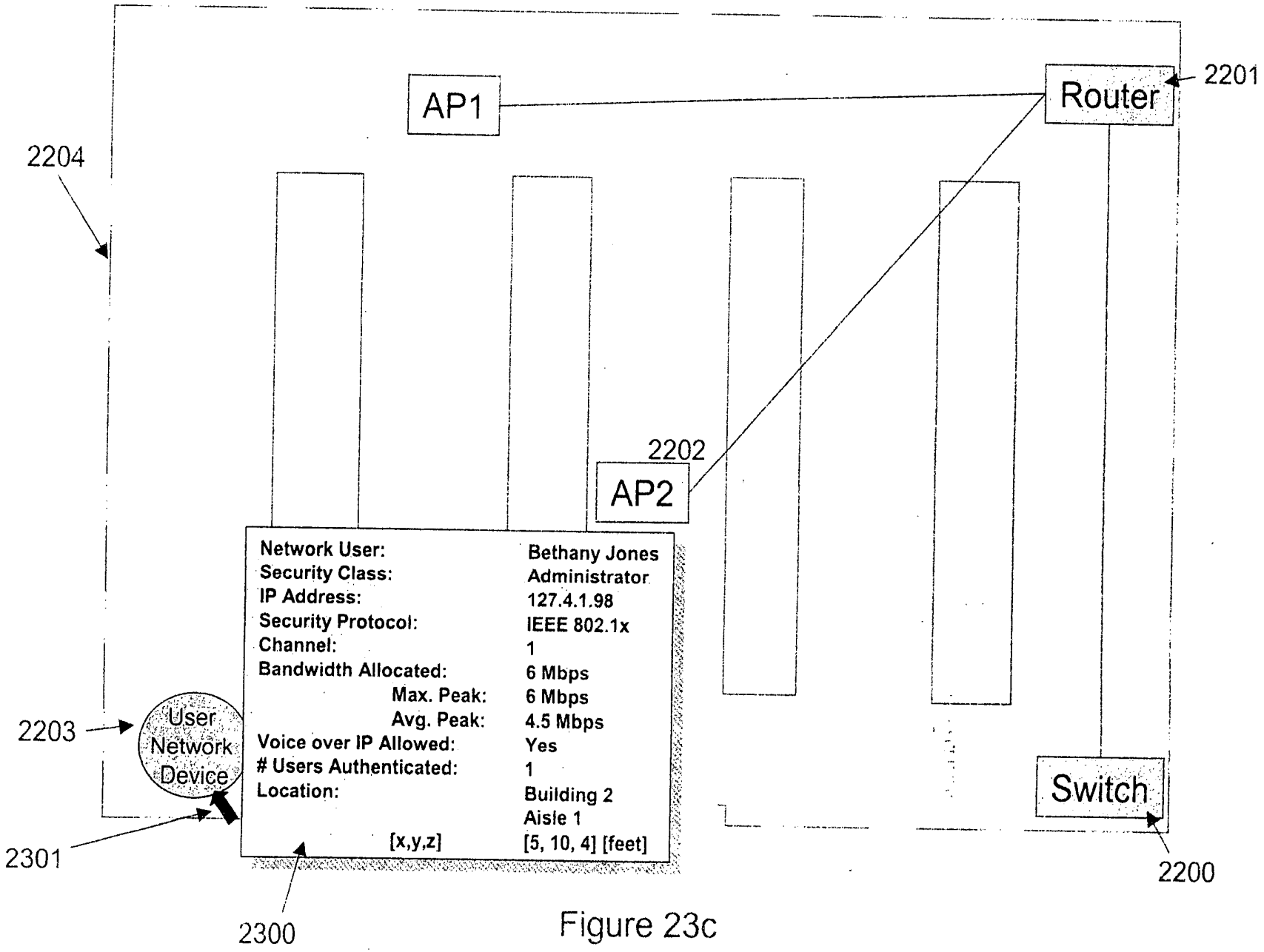

AP1
Router
2201
2204
2202
AP2
Network User: Bethany Jones
Security Class: Administrator
IP Address: 127.4.1.98
Security Protocol: IEEE 802.1x
Channel: 1
Bandwidth Allocated: 6 Mbps
Max. Peak: 6 Mbps
Avg. Peak: 4.5 Mbps
Voice over IP Allowed: Yes
Users Authenticated: 1
Location: Building 2
Aisle 1
[x,y,z] [5, 10, 4] [feet]
2203
User Network Device
2301
Switch
2200
2300

Figure 23c

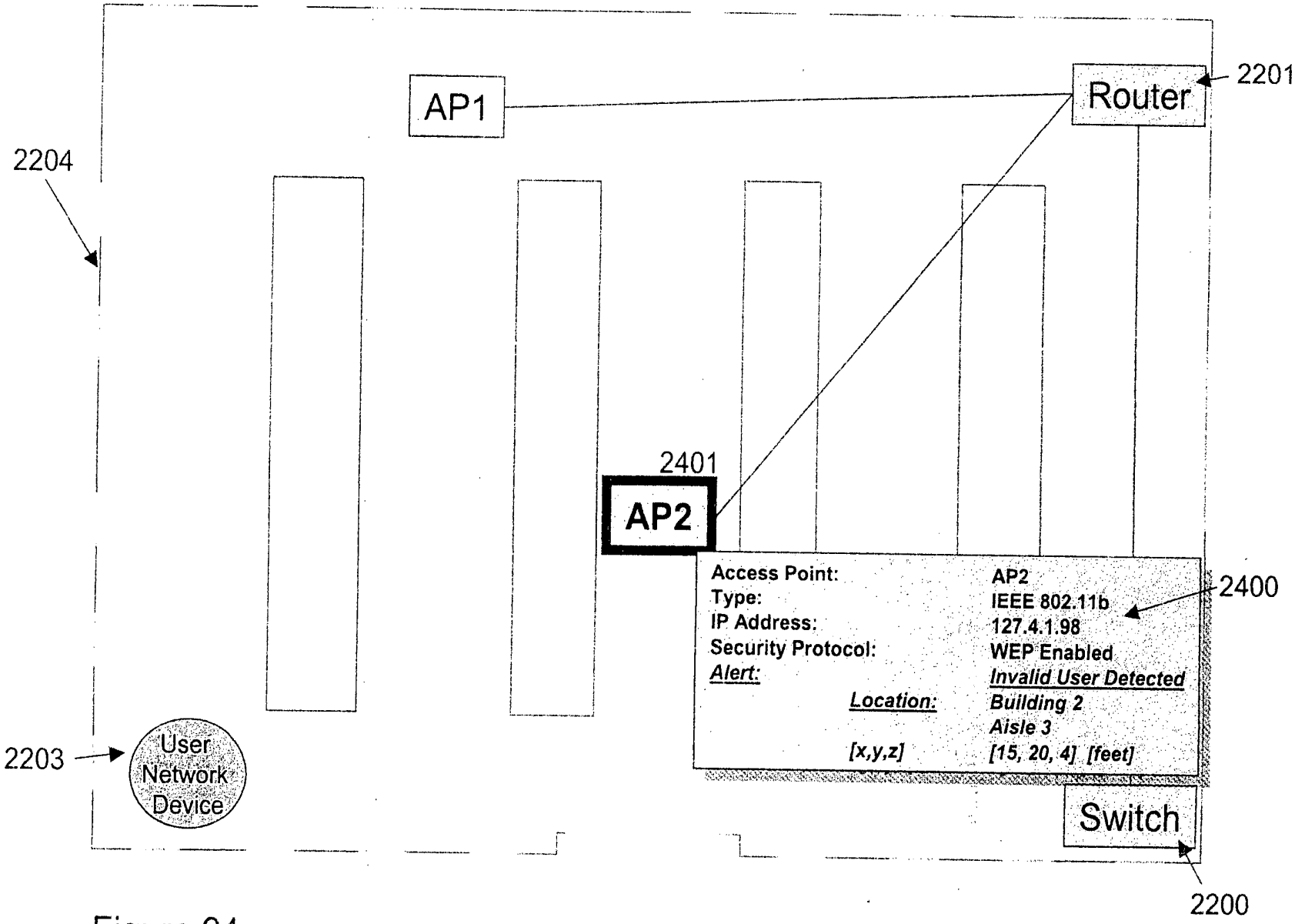

AP1
Router
2201
2204
2401
AP2
Access Point: AP2
Type: IEEE 802.11b
IP Address: 127.4.1.98
Security Protocol: WEP Enabled
Alert: Invalid User Detected
Location: Building 2
Aisle 3
[x,y,z] [15, 20, 4] [feet]
2400
2203
User Network Device
Switch
2200

Figure 24

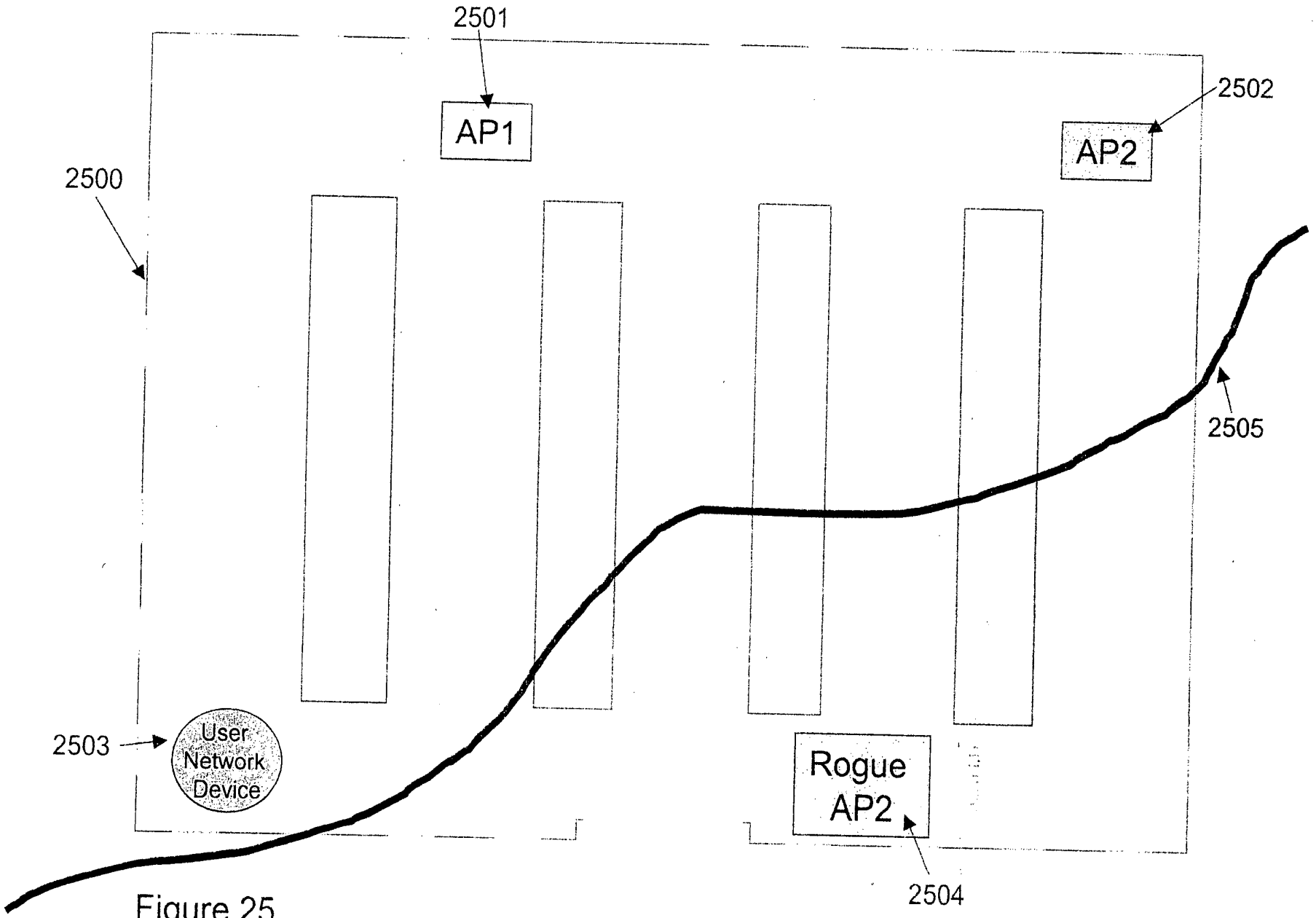

2501
AP1
2502
AP2
2500
2505
2503
User Network Device
Rogue AP2
2504

Figure 25

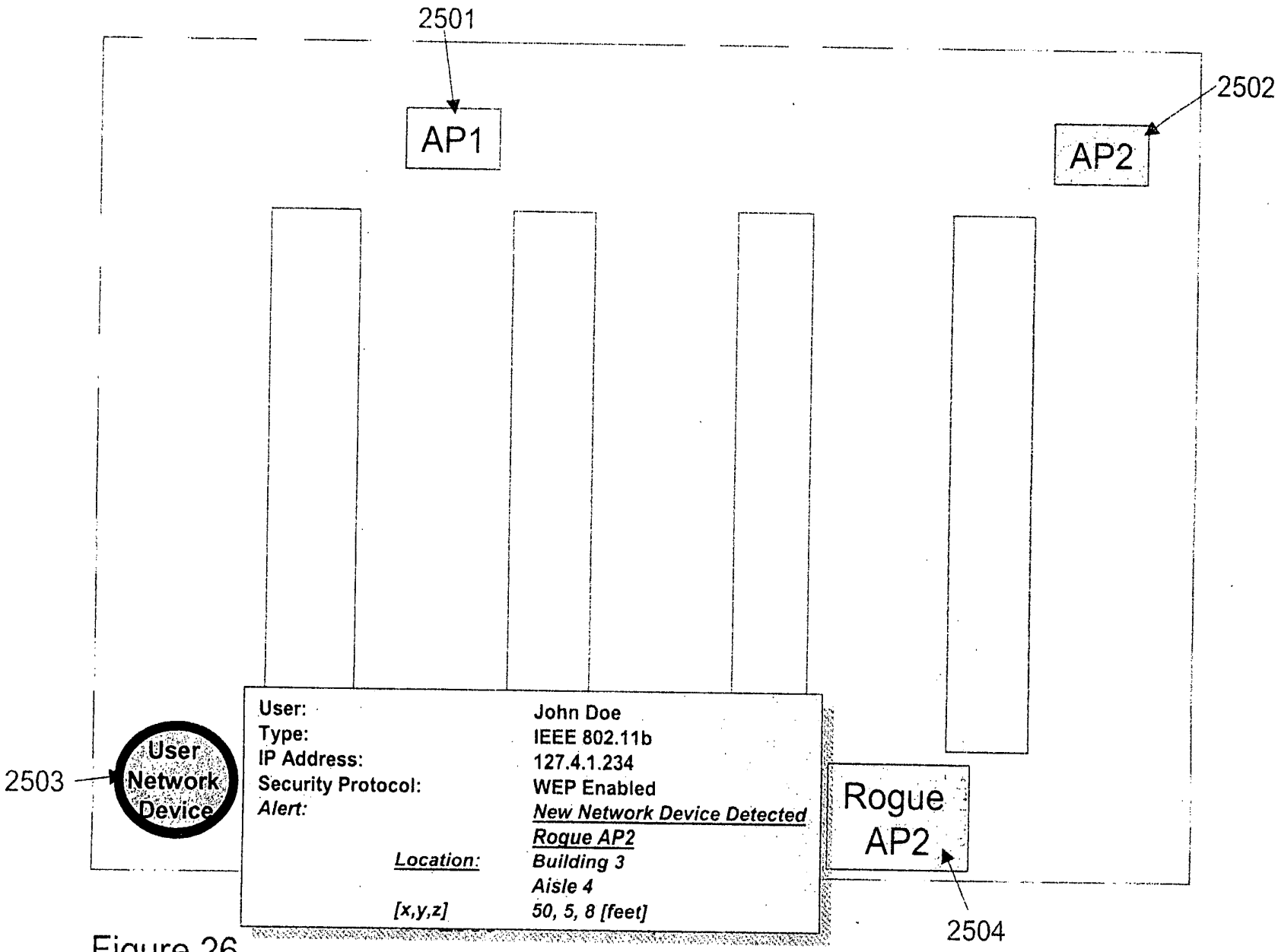

2501
AP1
2502
AP2
2503
User Network Device
User: John Doe
Type: IEEE 802.11b
IP Address: 127.4.1.234
Security Protocol: WEP Enabled
Alert: New Network Device Detected
Rogue AP2
Location: Building 3
Aisle 4
[x,y,z] 50, 5, 8 [feet]
Rogue AP2
2504

Figure 26

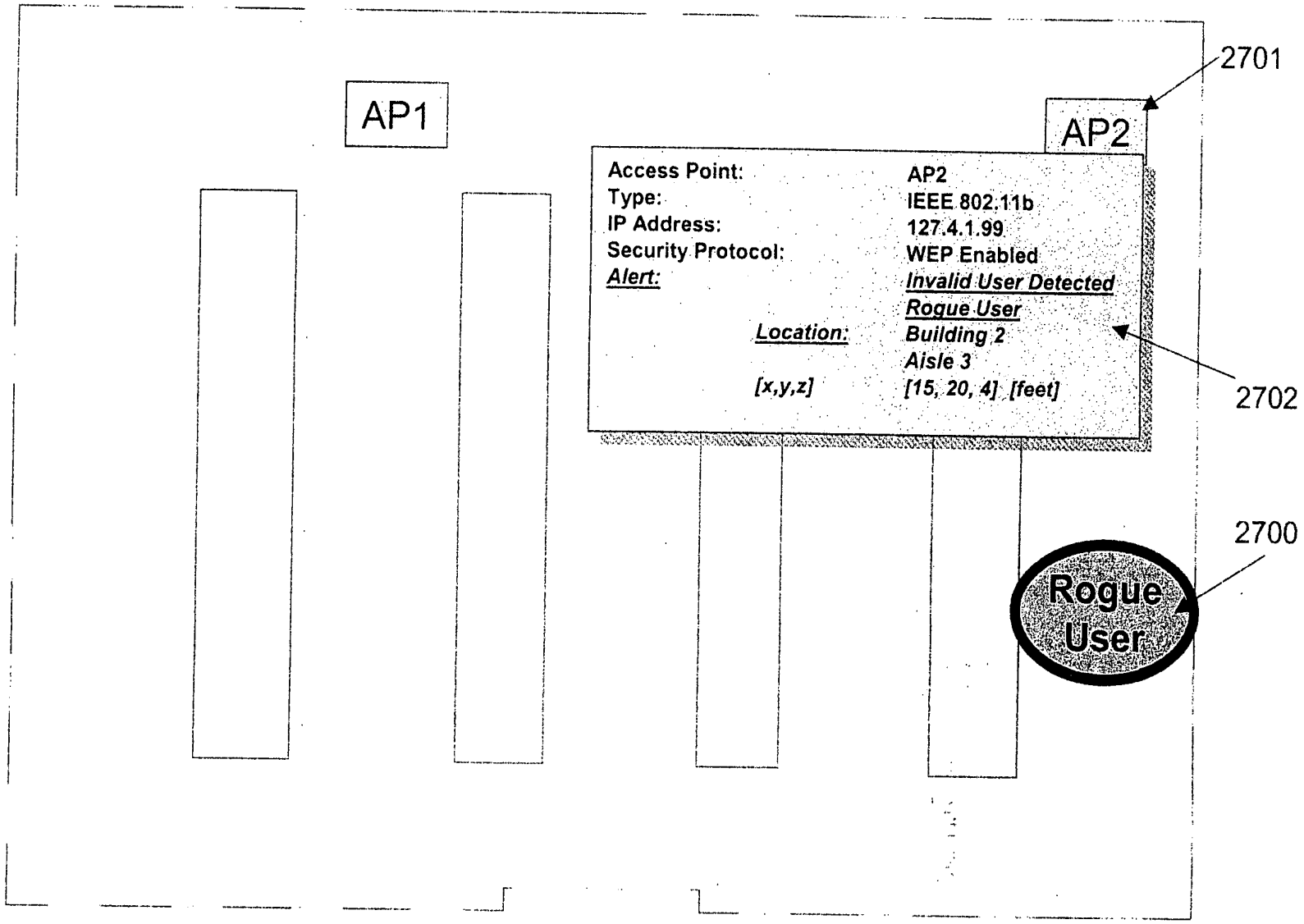
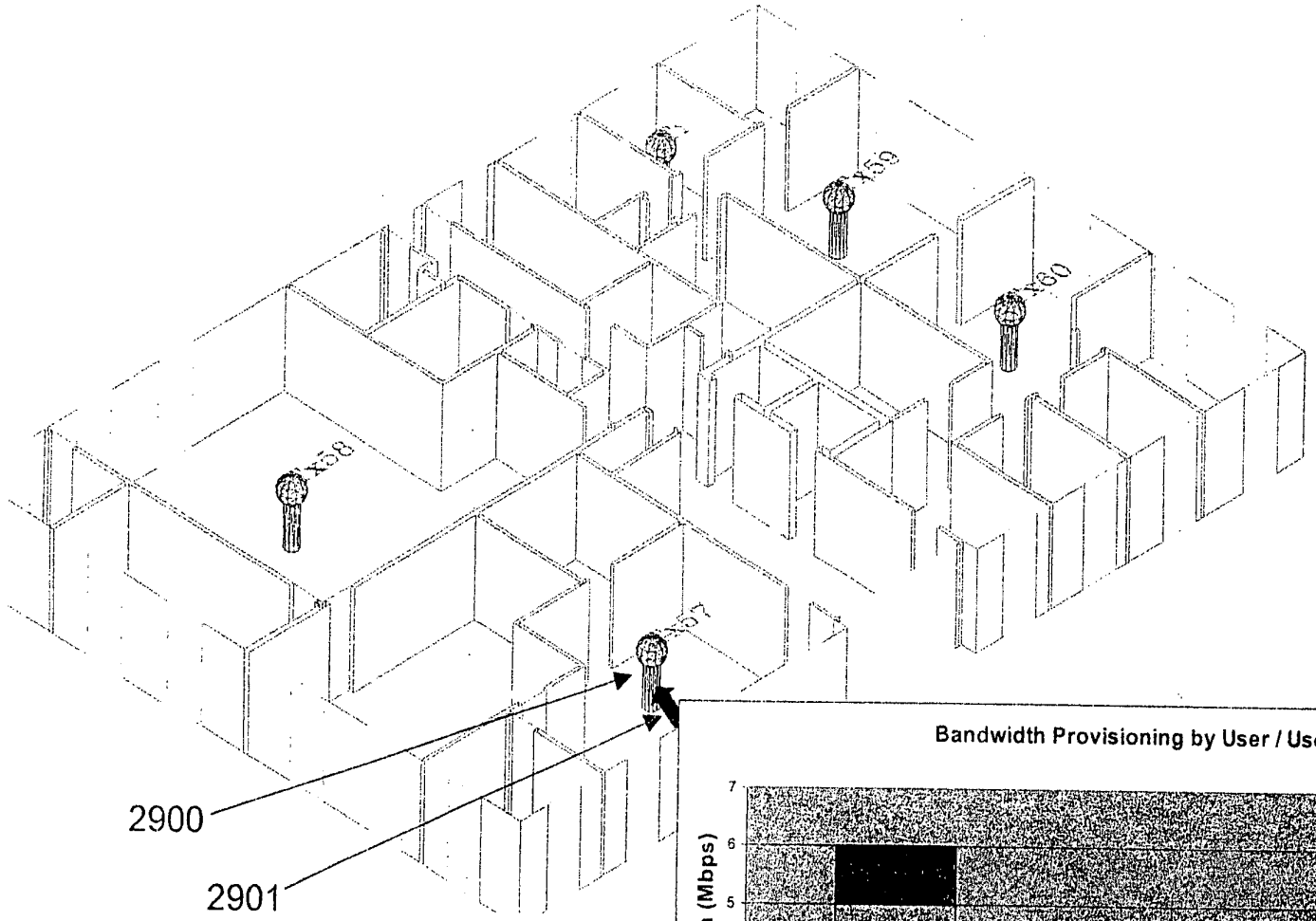

AP1
AP2
2701
Access Point: AP2
Type: IEEE 802.11b
IP Address: 127.4.1.99
Security Protocol: WEP Enabled
Alert: Invalid User Detected
Rogue User
Location: Building 2
Aisle 3
[x,y,z] [15, 20, 4] [feet]
2702
2700
Rogue User

Figure 27


2900
2901

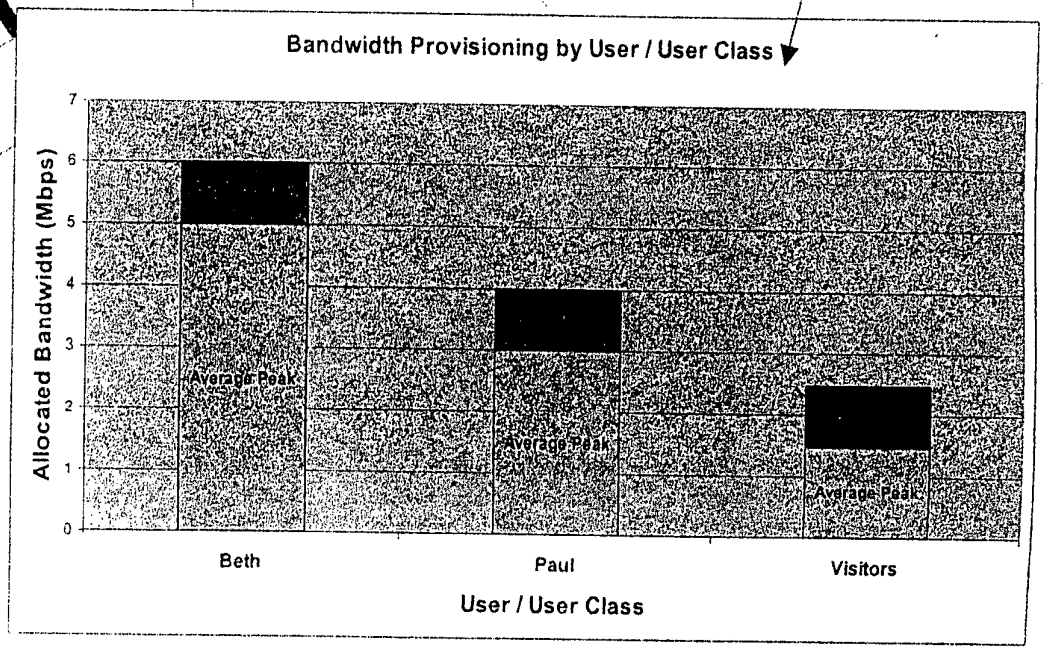

2902
Bandwidth Provisioning by User / User Class
Allocated Bandwidth (Mbps)
0
1
2
3
4
5
6
7
Average Peak
Average Peak
Average Peak
Beth
Paul
Visitors
User / User Class

Figure 29

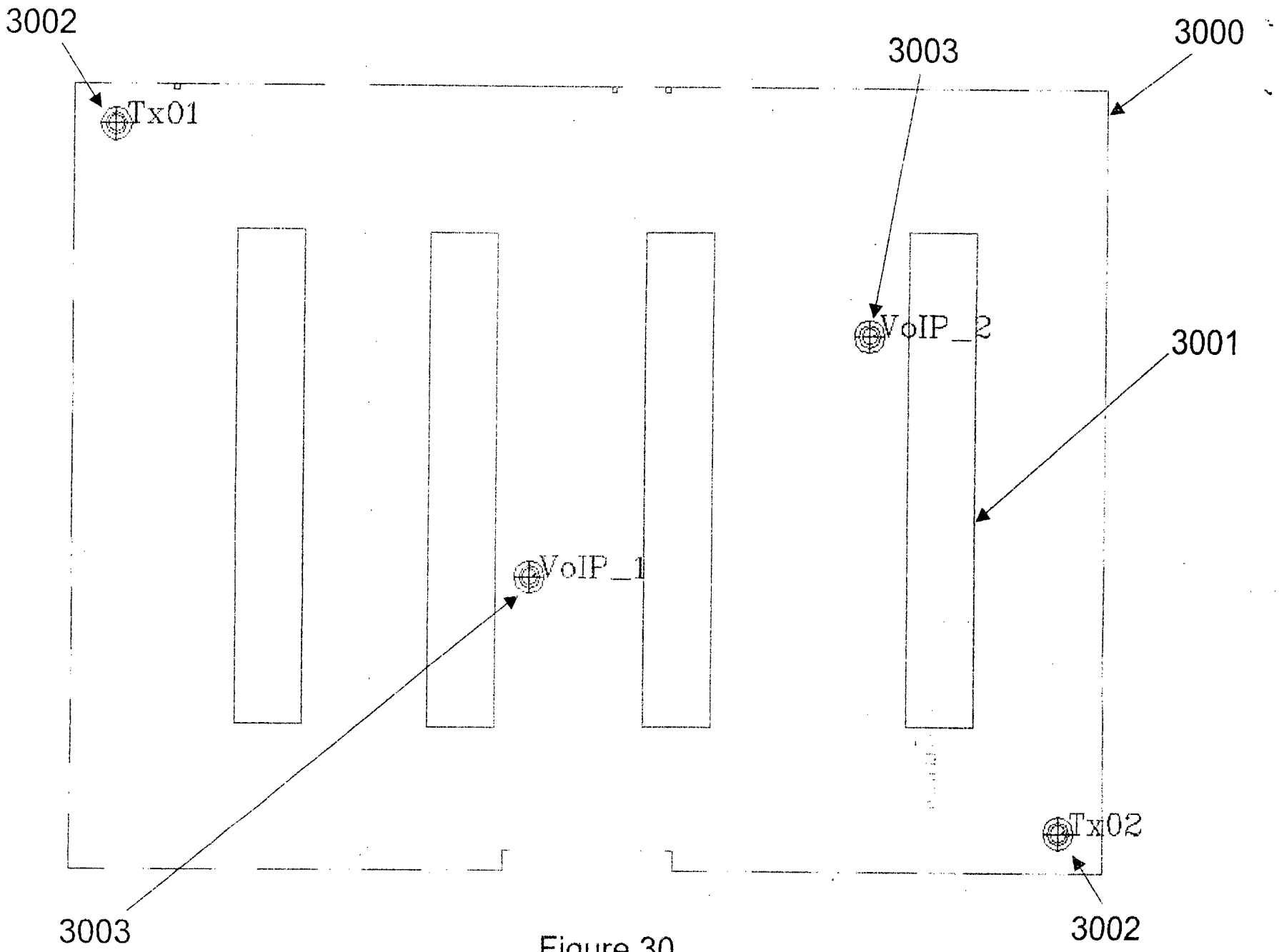


Figure 30

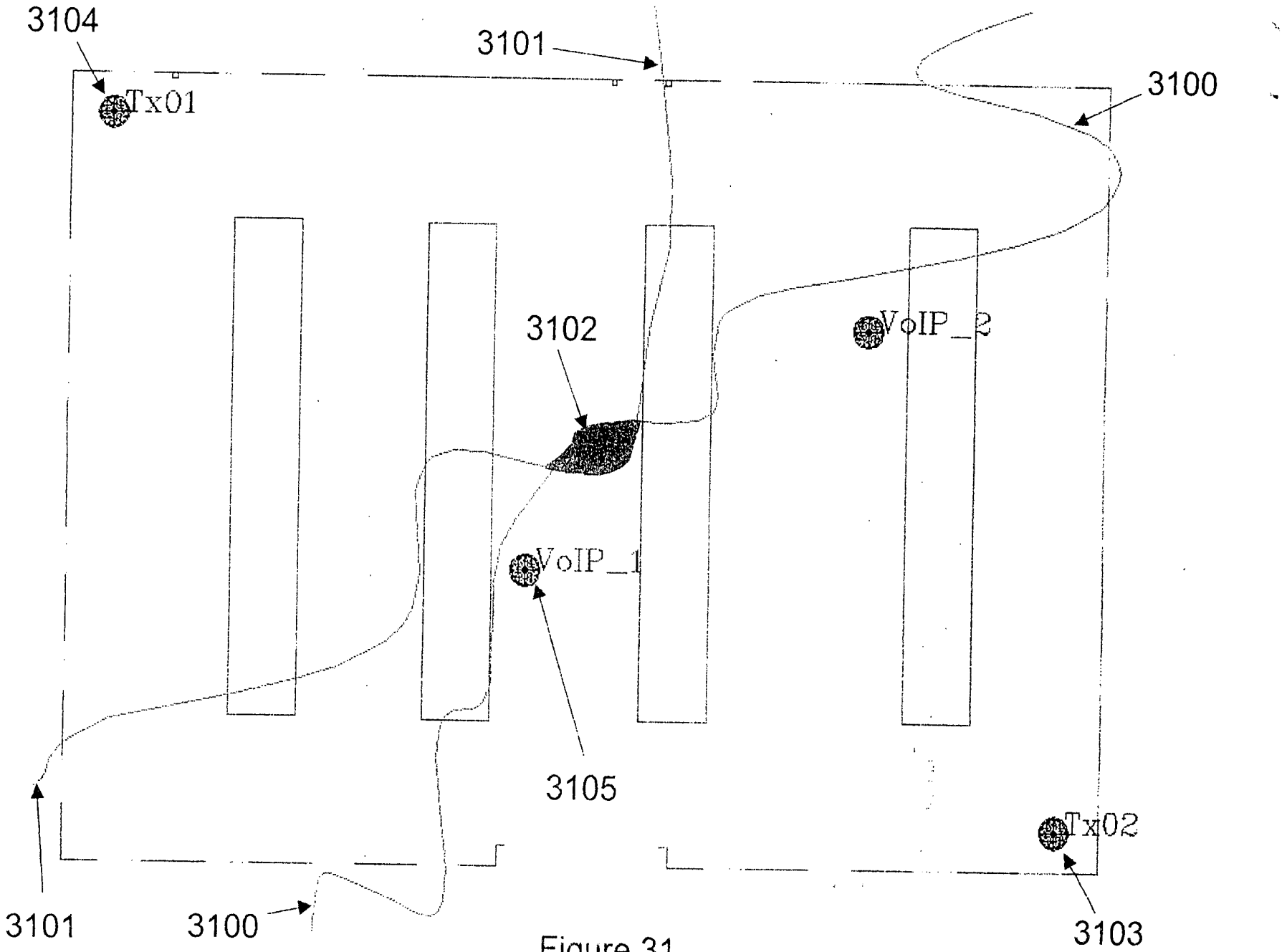

3104
3101
3100
Tx01
3102
VoIP_2
VoIP_1
3105
Tx02
3101
3100
3103

Figure 31

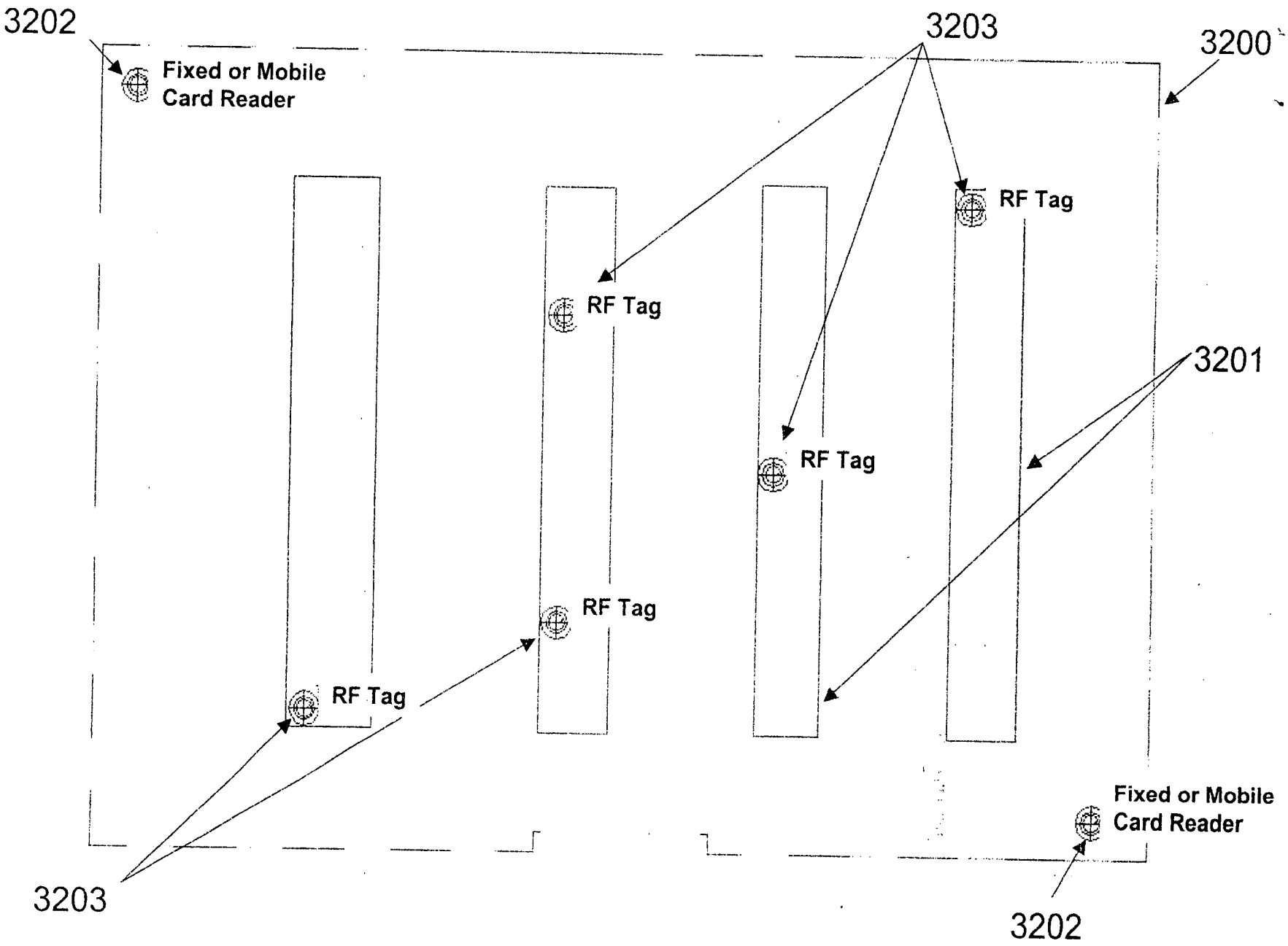

3202
Fixed or Mobile
Card Reader
3203
3200
RF Tag
RF Tag
3201
RF Tag
RF Tag
RF Tag
Fixed or Mobile
Card Reader
3203
3202

Figure 32

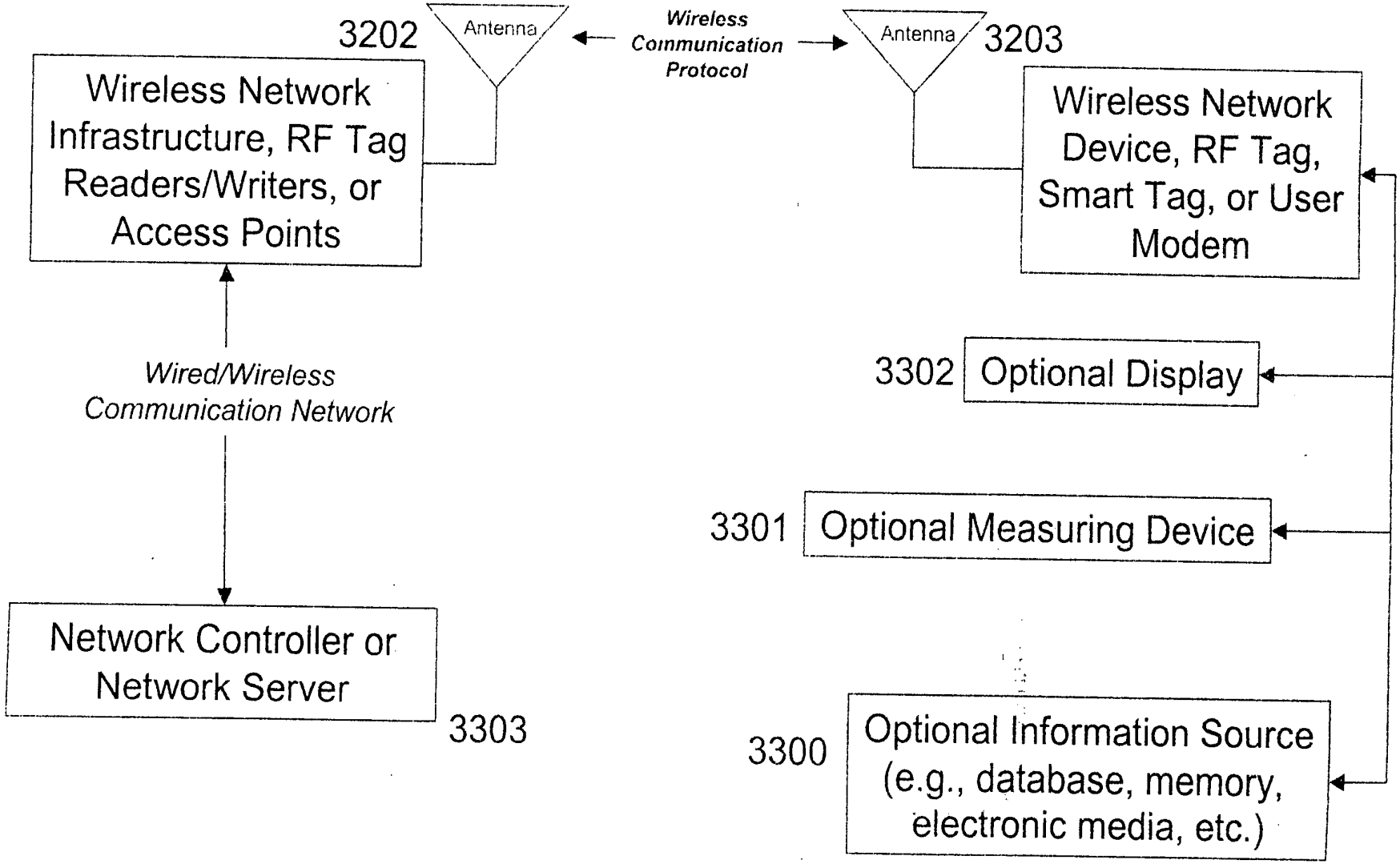

3202
Antenna
Wireless
Communication
Protocol
Antenna
3203
Wireless Network Infrastructure, RF Tag Readers/Writers, or Access Points
Wireless Network Device, RF Tag, Smart Tag, or User Modem
Wired/Wireless
Communication Network
3302
Optional Display
3301
Optional Measuring Device
Network Controller or Network Server
3303
3300
Optional Information Source (e.g., database, memory, electronic media, etc.)

Figure 33

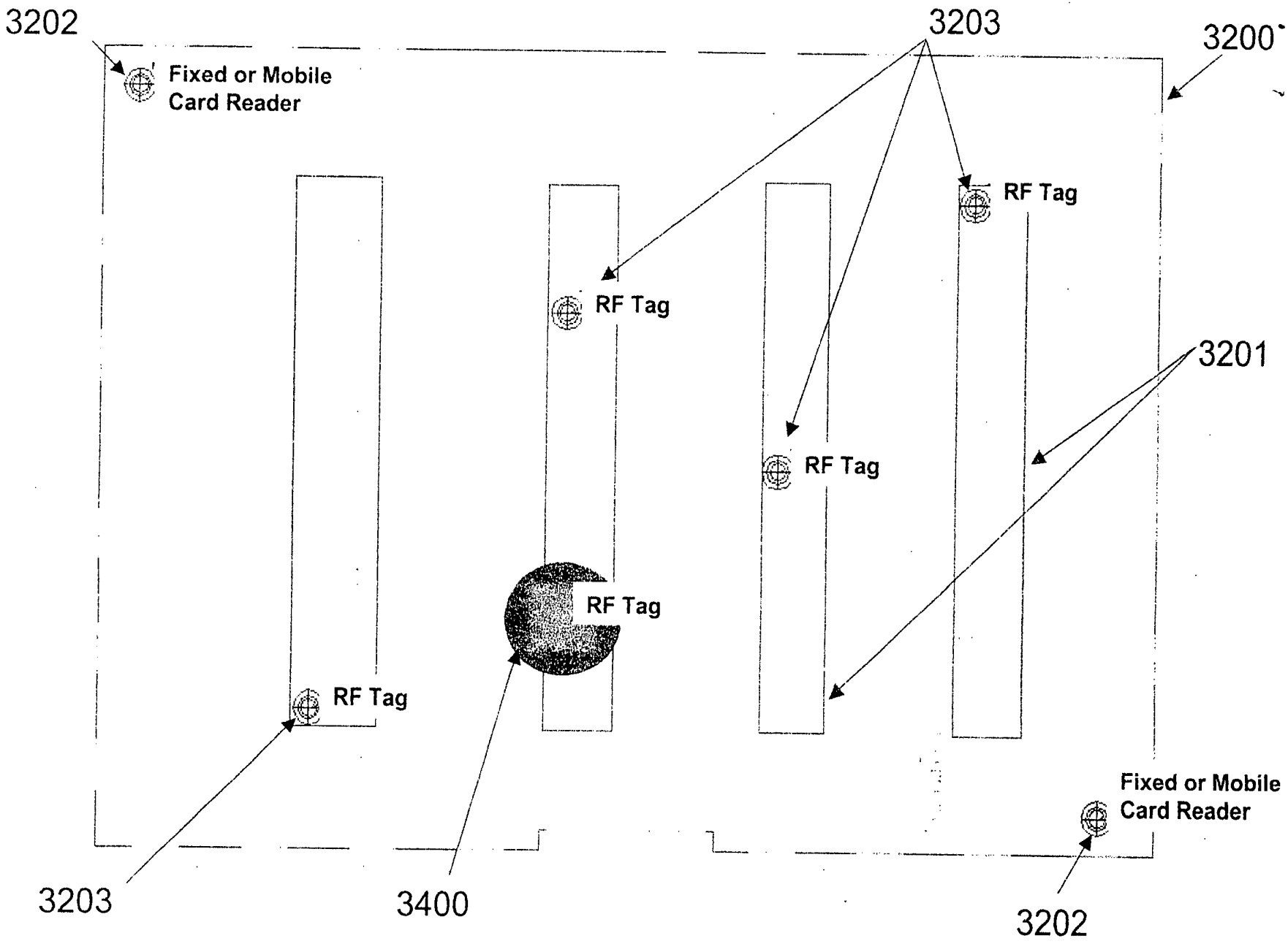

3202
Fixed or Mobile
Card Reader
3203
3200
RF Tag
RF Tag
3201
RF Tag
RF Tag
RF Tag
Fixed or Mobile
Card Reader
3203
3400
3202

Figure 34

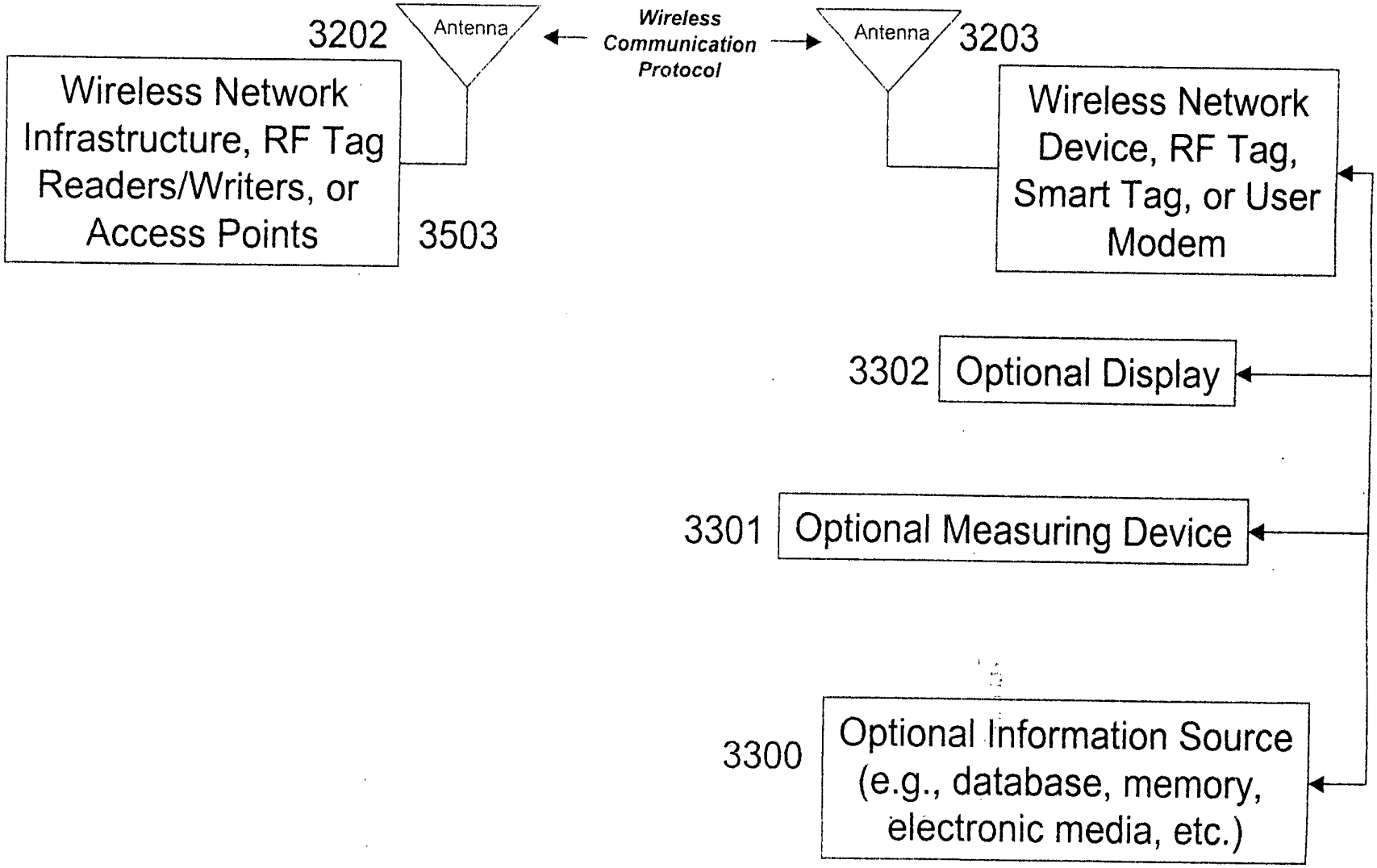

3202
Antenna
Wireless Communication Protocol
Antenna
3203
Wireless Network Infrastructure, RF Tag Readers/Writers, or Access Points
3503
Wireless Network Device, RF Tag, Smart Tag, or User Modem
3302
Optional Display
3301
Optional Measuring Device
3300
Optional Information Source (e.g., database, memory, electronic media, etc.)

Figure 35

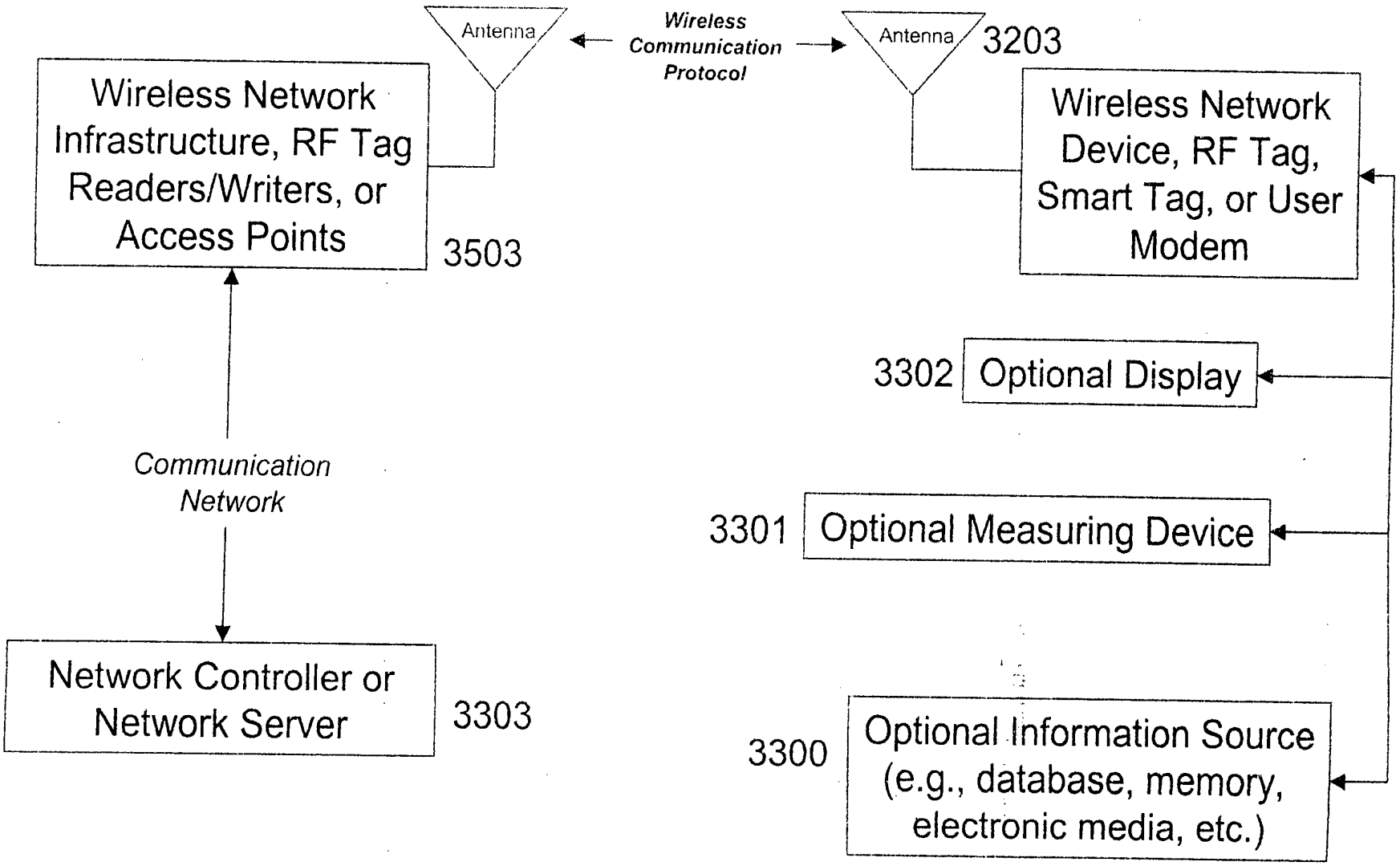

Antenna
Wireless Communication Protocol
Antenna
3203
Wireless Network Infrastructure, RF Tag Readers/Writers, or Access Points
3503
Wireless Network Device, RF Tag, Smart Tag, or User Modem
3302
Optional Display
Communication Network
3301
Optional Measuring Device
Network Controller or Network Server
3303
3300
Optional Information Source (e.g., database, memory, electronic media, etc.)

Figure 36